SCIENCE

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MSS. intended for publication and books, etc., intended for review should be sent to the Editor of SCIENCE, Garrison-on-Hudson, N. Y.

THE PROCEEDINGS OF THE AMERICAN SOCIETY OF ZOOLOGISTS.

THE fourth annual meeting of the Central Branch of the American Society of Zoologists and the second triennial meeting of the entire society was held in the museum lecture room at Ann Arbor, on December 27, 28 and 29, 1905. There were elected to membership in the Central Branch, Professor Burt G. Wilder, Professor W. J. Baumgartner and Professor S. J. Hunter; in the Eastern Branch Dr. N. M. Stevens, Professor Francis B. Sumner, Professor Charles G. Rogers, George Thomas Hargitt, Professor Edwin Linton, Dr. H. H. Newman, Dr. Emily R. Gregory and Dr. William E. Kellicott.

Officers of the Central Branch were elected as follows:

President—C. C. Nutting.
Vice-president—Geo. Lefevre.
Secretary-Treasurer—T. G. Lee.
Member of Executive Committee—J. G. Needham.

In the absence of any of the officers of the Eastern Branch they were reelected for another year.

The following papers were read:

The Living Egg of Anodonta as an Object for the Study of Maturation and Fertilization: CHARLES ZELENY, University of Indiana.

The living eggs of Anodonta may be of considerable value to inland laboratories where the lack of suitable material has been very striking as compared with the richness at the seashore. Contrary to the condition in *Unio*, the living eggs of *A. grandis*

and *A. edentula,* because of their transparency, are very suitable objects for the study of maturation, fertilization and early cleavage. The maturation divisions can be followed with ease and even the chromosomes can be made out as highly refractive bodies in the equator of the spindle. A study of the approach of the male and female pronuclei confirmed the observations of Lillie on sections of the *Unio* egg regarding the disappearance and reappearance of the central sphere. The central sphere at the side of the male pronucleus disappears as the two pronuclei approach each other and for a considerable period there is no sign of a central sphere in the egg. Then a central sphere forms in connection with each pronucleus and astral radiations appear around it. The two central spheres thus produced serve as the centers of the first cleavage spindle.

On the Interpretation of the Maturation Chromosomes of the Orthoptera: C. E. McClung, University of Kansas.

A very general interest centers about the interpretation of the chromosomes of the grasshoppers since every possible derivation of the tetrads has been described as showing itself in their spermatocytes. Thus Wilcox detects a double cross division, de Sinéty a double longitudinal one, while I and my students are convinced that in most of the tetrads there are present for the first spermatocytes a plane of longitudinal cleavage and for the second a cross division. Montgomery, from a brief study of one species, argues for a cross division in the first spermatocytes and a longitudinal in the second. From the fact that all these interpretations have been based upon practically the same material, it is important to determine which is the correct one, for it will materially strengthen the assumption that this is the type that is generally prevalent. I have recently gone over a large number of species of Acrididæ and am convinced that my early conception of the tetrad as a rod split lengthwise and again at right angles to this, with the mantle fibers attached at the level of the cross split, is the correct one. These two planes of division have been found in the very early prophases and traced through the two spermatocyte divisions. The ring figures present indisputable evidence that the first cleavage of the rod is along the length of the chromatin thread. These facts are demonstrated by a large series of photomicrographs.

The Chromosome Complexes of Hesperotettix speciosus and H. viridis: C. E. McClung, University of Kansas.

As I reported at the preceding meeting of the society, the genus *Hesperotettix* has a peculiar grouping of the chromosomes that characterize the Acrididæ. This manifests itself particularly in the multiple chromosome which is constituted of one of the large tetrads and the accessory chromosome. The two species of the genus show differences in size and shape that are striking and unmistakable, but which are not easy to describe. A full series of illustrations will be presented in a subsequent paper. Accompanying the chromosomic differentiation there is also one of the spindle of the first spermatocyte. This in *H. speciosus* is long and full while in *H. viridis* it is short and weak. In another species, *H. pratensis,* that is just being taken up for study, the same elements are characteristically different from the other two species, but have the generic features equally well marked.

Further Observations on Artificial Parthenogenesis: George Lefevre, University of Missouri.

In a former communication[1] some pre-

[1] Science, N. S., Vol. XXI., No. 532, p. 379, March 10, 1905.

liminary results were reported from a study of artificial parthenogenesis in the echiuroid *Thalassema mellita* Conn. At that time it was stated that unfertilized eggs of this worm may be induced to develop into actively swimming trochophores by immersion for a few minutes in dilute solutions of acids, both inorganic and organic.

Continued and more detailed examination of the material has yielded many additional facts of interest.

The parthenogenetic development in many cases involves a perfectly normal maturation, a more or less regular cleavage, and the usual processes of differentiation leading up to the formation of the normal larva.

The unfertilized egg of *Thalassema* when left in sea-water exhibits no developmental changes, and the germinal vesicle remains intact until the egg dies. After a short exposure to the acid-solutions, however, the egg rounds out upon a return to pure sea-water, and throws off a typical fertilization-membrane. As a rule, both polar bodies are extruded, and sections show that in these eggs the maturation-mitoses occur in a normal manner. After maturation, the egg-centrosome and aster disappear; the pronucleus forms from the reduced number of chromosomes and moves to the center of the egg; the two cleavage-asters with their centers appear *de novo* and simultaneously at opposite poles of the egg-nucleus; the first cleavage-figure is then formed, and division of the egg into two equal blastomeres takes place normally.

In many cases, subsequent cleavages occur in a normal manner, as far as they can be followed, although the rhythm of division is more or less disturbed; in such cleavages, cytoplasmic division regularly accompanies division of the nucleus, and the mitotic phenomena involved are in all respects normal in appearance. The reduced number of chromosomes (12), however, persists, and has been repeatedly counted even in late blastula- and gastrula-stages.

Gastrulation consists of the insinking of an entoblastic plate of cells which multiply by division and give rise to the enteron; the latter becomes secondarily divided into stomach and intestine; the œsophagus is formed after gastrulation by an ectodermal invagination which is subsequently placed in communication with the stomach. These processes of differentiation, together with the formation of the prototrochal band and apical flagella, are in all essential respects identical with the corresponding normal events.

In addition to the cases mentioned in which the normal differentiations are closely paralleled, many abnormal processes have also been observed. In some experiments only one polar body was extruded, and in others neither was formed; upon sectioning such eggs, it was found that either one or both maturation-mitoses take place well below the surface and without accompanying cytoplasmic division. Certain interesting phenomena are associated with these unusual processes, to which only a reference can be made in this place.

The formation of large monasters was not infrequently observed, the rays appearing and disappearing rhythmically and the chromosomes dividing repeatedly without cleavage of the cytoplasm.

Nuclear division occurring in the absence of cytoplasmic division often results in a multiplication of chromosomes, which may then be gathered into a single giant nucleus or grouped on a single giant spindle.

An endless variety of abnormal cleavages, similar to those described by others, have been observed; such cleavages frequently lead to the formation of ciliated structures, which, however, depart more or

less widely from normal embryos and larvæ.

Differentiation of the egg does not occur in the absence of cleavage, and all ciliated bodies observed, whether normal or abnormal, possess a cellular structure.

The Keimbahn of Chrysemys: Bennett M. Allen.

Morphology of Cœloplana: J. F. Abbott, Washington University.

Ample material was rediscovered in Japan. Careful histological study shows that contrary to frequently expressed opinion *Cœloplana* has practically no planarian affinities and can not be considered a primitive form, but rather a highly specialized ctenophore. The adoption of littoral habits has produced great divergence from the typical organization of ctenophores. On the other hand, there are many points of structure characteristic of pelagic Ctenophora that are retained in *Cœloplana* as vestigial structures, apparently useless to a crawling animal, but indicating a pelagic origin. Among the points worked out in *Cœloplana* new to ctenophore morphology are the development of respiratory dorsal tentacles, the normal sloughing off of digestive epithelium from the gastric canals and a method of origin of the adhesive cells of the tentacles at variance with the descriptions of other investigators.

The Origin of the Proglottids in the Cestode Crossobothrium laciniatum: W. C. Curtis, University of Missouri.

The method accepted as the universal one by which the proglottids of a cestode originate, does not obtain in the species *C. laciniatum*. This cestode, instead of forming its proglottids by the appearance of each new one between the scolex and the most anterior proglottid of the chain, shows the proglottids originating in the following manner: there appear at the posterior end of the young worm segments which we will term the 'posterior proglottids.' These extend over about the posterior fourth of the body and arise from behind forward after the manner described for other cestodes. When about fifty such 'posterior proglottids' have appeared, others, which we will term the 'anterior proglottids,' begin to develop in the region just behind the scolex. These 'anterior proglottids' appear *in the reverse direction so that the oldest is the one next to the scolex.* From this time on the worm is, therefore, segmenting from both ends toward a point somewhat anterior to the middle of its length.

The anterior end produces upwards of fifty, the posterior upwards of two hundred, proglottids before the two meet and all sign of the transition from one region to the other disappears.

After reaching such an 'adult' condition, no more proglottids are formed until the ones already in existence have been greatly reduced in numbers by the liberation of motile proglottids from the posterior end. When this reduction has progressed so far that the reproductive organs are beginning to appear well into the region occupied by proglottids which had an anterior origin, the part of the worm between the scolex and the most anterior proglottid elongates into a neck which eventually segments into posterior and then into anterior proglottids as did the young worm.

The bearing of these facts upon current explanations of the nature of the cestode body will be discussed in a forthcoming paper.

Some Observations on Gastropod Nerve Cells: W. M. Smallwood and C. G. Rogers, Syracuse University.

This report includes studies on the opisthobranchs, nudibranchs and especially the pulmonates, *Planorbis* and *Limax*. Many cytological observations have already been

made on the finer structure of invertebrate nerve cells, but no one has combined to any extent physiological experiments on the same animal. So many terms have already been proposed for the structures described by other writers that no attempt is made to homologize these several terms.

In the cytoplasm of *Limax* and *Haminea* there is present in the animal taken from its normal habitat a varying number of lymph spaces which exhibit neither a constant shape nor a constant position. In some instances the limiting wall of the lymph space takes a definite stain, while in others there is no indication of a structure which we might designate as a wall. These lymph spaces in *Limax* are either free from any solid staining bodies or there may be as many as a dozen different bodies in a single space. To be sure that these spaces and bodies were normal characteristics of the cytoplasm, the nerve collar was dissected from the living snail and individual nerve cells studied. The spaces can be seen in the unstained living nerve cell, but the bodies only when some neutral methylene blue is introduced under the cover glass.

The experimental evidence indicates that, contrary to the usual observations on nerve cells, the nucleus shows no evidence of shrinkage. When *Limax* is stimulated until exhausted by induction currents or a needle the bodies which are so prominent in the unfatigued animal have disappeared. In order to ascertain what became of these bodies the living nerve cell was mounted on a slide between electrodes of platinum foil and the alternating current from an induction coil was then passed between the electrodes. Within a half hour the dark bodies began to break down; within an hour or an hour and a half they had entirely disappeared. After a period of rest new bodies similar to the old ones again appear in the cytoplasm. It seems to us highly probable that these bodies are stores of energy giving stuff which may be called on in emergency to renew the protoplasm of the cell.

The bodies found in *Planorbis* seem to be entirely different from those found in *Limax*. When *Planorbis* is fed on chestnuts for a few weeks a large number of golden-yellow bodies can be seen in the unstained nerve cell accumulated chiefly around the base of the axone. These bodies do not stain with methylene blue nor disappear when subjected to an electrical stimulus.

Experiments and analyses are under way to determine the nature of these bodies.

The Nematocysts of Eolis: O. C. GLASER, University of Michigan.

The evidence of Wright ('58), Grosamor ('04[2]) and myself ('04[1] and later) that the nematocysts in the cerata of *Eolis* are derived from cœlenterates was reviewed and found valid. The adaptiveness of these transferred nettling organs, however, is not as easily determined as their origin. Since they discharge and inflict pain, they are as efficient in these respects as before ingestion. My observations show, however, that despite their great concentration in *Eolis,* they are not as generally effective as has been supposed. In combats with its own kind, the cerata are attacked directly and eaten voraciously.

When irritated, *Eolis* curls up; the cerata project like quills from a porcupine, or are cast off by autotomy. An attacking fish is certain to fill its mouth with nematocysts, both because the appendages containing them are numerous and because they are most conspicuously colored.

Various fishes behave differently in the presence of *Eolis.* The blennie, which lives in great numbers on the same hydrids with *Eolis,* ordinarily is indifferent to the presence of the latter, but when aroused by

hunger, or another cause, crops the cerata until none remain.

Fundulus at first is excited in the presence of *Eolis,* but on longer acquaintance will take detached appendages if offered. I have never seen a *Fundulus* repeat this act, though it will devour, even after having taken detached cerata, an *Eolis* devoid of them. This seems to indicate that the colors of the appendages are warning colors.

The elaborate preparations made by the cnidophore sacs for receiving and storing the nematocysts indicate the advantage to *Eolis* of ridding itself of these structures. Probably their use as weapons, in cases in which they so serve, is secondary and accidental, the real and original function of the cnidophore sacs being the elimination of the nematocysts.

The Sense Organ of the Bill and Lateral Line of Polyodon Spathula: Henry F. Nachtrieb, University of Minnesota.

Correlated Abnormalities in the Scutes and Bony Plates of Chelonia: H. H. Newman, University of Michigan.

An examination of the carapaces of large numbers of *Graptemys geographica* and *Chrysemys marginata* show that there is always a precise correlation of supernumerary or deficient scutes and plates of the marginal series. In the neural series correlation is frequent between extra procaudal plates and the supernumerary scutes of that region.

No correlated abnormalities were found in connection with the true neural or costal plates which are produced by periosteal expansions of the ribs and neural spines of the vertebræ.

Correlations occur only in regions where plates of dermal origin exist—in the marginal and procaudal regions. This may be used as evidence in support of the theory that there existed at one time a dermal carapace composed of tubercular or flattened chitinous elements (scutes) with cores or supports of dermal bone. The rapid secondary expansion of ribs and neural spines rendered these dermal bony supports superfluous in the large central portion of the carapace, but in other regions they persisted as the marginal, nuchal, procaudal and pygal plates.

In these regions, then, we should not be surprised to find correlated recurrences of lost scutes and plates, since a genetic connection exists. The procaudal and pygal plates are distinctly in serial homology with the dorsal processes of the tail of *Chelydra,* leading to the belief that such processes at one time extended much further forward.

Vestiges of dermal bones in the midneural region of the carapace were found in *Graptemys* in just the places where they would be expected—beneath the keels of the second, third and fourth neural scutes. A considerable amount of additional evidence in support of this view will appear in a paper now in press.

The Production and Control of Infertility by Inbreeding: W. J. Moenkhaus, University of Indiana.

The Direction of Differentiation in a Regenerating Appendage: Charles Zeleny, University of Indiana.

The problem of the direction of differentiation in a regenerating appendage was studied in the antennule of the common brook sow-bug, *Asellus,* which is exceptionally favorable because of striking and constant differences in the segments. It was found that the visible differentiation starts at the basal and terminal ends and proceeds toward the middle of the regenerating tissue. The basal differentiation, however, appears slightly in advance of the terminal one.

The Regeneration of an Antenna-like Organ in place of the Vestigial Eye of the Blind Crayfish: CHARLES ZELENY, University of Indiana.

In the blind crayfish (*Cambarus pellucidus testii*) the eyes have become degenerated to such an extent as to be perfectly functionless. The retinal structures if present at all are represented merely by a few small groups of granular cells. The right eye-stalk was removed in nine specimens of this crayfish. Three lived for a year after the operation. One of these regenerated an antenna-like organ in place of the removed eye-stalk. The new organ is segmented and the terminal half is covered with tactile hairs. All appearances point toward the supposition that the organ is a functional one and its function is probably tactile in character. The instance, therefore, represents a case of the regeneration of a functional organ to replace a removed non-functional one.

The Young of Scutigerella immaculata: S. R. WILLIAMS, Miami University.

A *Scutigerella,* which had remained quiescent for ten days beneath a glass slide (in a bubble of air) in a stender dish, laid eight eggs on May 25, 1904.

She remained with the eggs continuously until they hatched on June 6. June 7 one was removed. It proved to have six pairs of legs, as was previously stated to be the probability at the St. Louis meeting of the Association for the Advancement of Science.

The disturbance of the nest caused the mother to desert the remaining young and by the morning of the following day these had all disappeared. It is practically certain that they were eaten by the other *Scutigerellas* in the stender dish.

The San Diego Marine Biological Association and its Work: C. C. NUTTING, University of Iowa.

Some Points on the Habits and Anatomy of Placobdella Pediculata, N. Sp.: HENRY F. NACHTRIEB, University of Minnesota.

An Ecological Survey of Isle Royal, Lake Superior: CHAS. G. ADAMS, University of Michigan.

The Pearl Organs and Spawning Behavior of American Suckers and Minnows and their Bearing upon Current Theories of the Origin of Secondary Sexual Characters: J. REIGHARD, University of Michigan.

Some Relations of Protozoa to Certain Ions in their Medium: A. W. PETERS and M. H. REES, University of Illinois.

In one series of experiments the resistance of *Paramœcia* to low concentrations of H and OH ions was tested by keeping the animals in media consisting of pure salt solutions made to contain a serial range of known concentrations of H and OH ions. Tests were also made with distilled water. No food or other organic matter was present in any of these media. The numerical results showed a greater resistance in the OH than in the H media. In another series of experiments further tests upon the resistance of *Paramœcium* and *Colpidium* to H and OH ions were made under conditions as nearly natural as possible. The original nutritive media were subjected to quantitative chemical and physical examination and in different portions of these media a serial range of concentrations in H and OH was produced and also quantitatively estimated. The animals having lived for twenty-four hours or longer in media so prepared, were subjected in the same media to instantaneous killing tests, one of which consisted of pure HCl, the other of HCl + NaCl. The least gram ionic concentration of H which killed instantly was accurately determined and was taken as the measure of resistance. Curves representing all the results show

that the animals that have lived in media containing OH ions have a lower resistance to HCl than the animals that have lived in media containing H ions. *Colpidia* have a higher resistance than *Paramœcia,* for both H and OH media. The HCl + NaCl solution has a greater effect on both *Paramœcium* and *Colpidium* than the same concentration of HCl used alone would have. Experiments here made show that the NaCl used alone is physiologically favorable. The increased effect when both are used is due to greater gram ionic concentration of H which would be expected in the mixed solutions in accordance with conductivity measurements of Lincoln and of Jones and Knight.

Phagocytosis in a Mammalian Embryo: M. M. Metcalf, Oberlin College.

On the Rôle of the Substantia reticularis in the Evolution of the Vertebrate Brain: J. B. Johnston, University of West Virginia.

The vertebrate nervous system consists of somatic sensory, visceral sensory, somatic motor and visceral motor divisions. Each of these divisions is represented by central and peripheral structures in each segment of the head and trunk, except where the organs to be innervated are wanting. The central portion of each division constitutes a continuous zone or column in the spinal cord and brain. These longitudinal columns are the fundamental divisions of the central nervous system. In addition to these there are in the central system numerous cells which are left over after the four main columns are differentiated. These cells serve functions of connection and correlation between the four columns and between distant segments of the central system, and constitute the substantia reticularis grisea. The cells of the substantia reticularis are indifferently scattered throughout the four divisions, and when one or other division is absent they form the whole gray matter in its place.

The very important rôle which this substance plays in the formation of higher brain centers is illustrated by the gustatory and olfactory centers and by the evolution of the cerebral hemispheres. The gustatory central apparatus in fishes includes a secondary nucleus in the cerebellar segment and a tertiary nucleus in the inferior lobes of the diencephalon. Both of these are probably differentiated from the substantia reticularis occupying the primitive visceral sensory zone. The relations of these structures in fishes should serve as a guide in discovering the gustatory centers in man. The olfactory apparatus has secondary nuclei in the forebrain and tertiary nuclei in the inferior lobes and in the nuclei habenulæ of the diencephalon. These tertiary centers belong to successive neuromeres of the primitive brain and to the same chief zone. The cerebral cortex comes from two sources. The one is the visceral substantia reticularis called epistriatum in lower fishes, which forms the hippocampus. The other is an unknown starting point possibly identical with the center of the *N. terminalis* in fishes, which forms the general pallium whose functions are primarily the direction of actions with reference to the outside world.

A New Form of Cutter for Wax Plates: E. L. Mark, Harvard University.

An Oil-Immersion Paraffine Bath: George Lefevre, University of Missouri.

A paraffine-bath was described which has been designed upon a new principle. Each cup or vessel used for holding paraffine is suspended in a well containing oil, which is, therefore, in contact with the sides and bottom of the vessel. By the application of heat through the mantle of oil, a uniform temperature throughout the paraffine is obtained, and, owing to the low con-

ductivity of the oil, the surface of the paraffine may be exposed to the air indefinitely without congealing; and, furthermore, since a film of warm oil adheres to the outside of the vessel when the latter is taken from the well, the paraffine remains melted off the bath for a considerably longer time than it does without this protection, thus making possible a much more leisurely process of embedding.

The advantage of immersing the vessel in oil is especially conspicuous in embedding free, minute objects, like small eggs, which have been saturated with paraffine while contained in glass vials and which must be handled by means of a pipette.

The oil which has been usually employed in the bath has been olive oil.

A Case of Dibothrocephalus latus Infection Acquired in America (Minnesota): W. S. NICKERSON, University of Minnesota.

The author reports the first known instance of locally acquired infection by the broad human tapeworm. A Finnish child, born in Minnesota, which had never fed upon imported fish of any kind, passed a specimen of *Dibothrocephalus latus* seven feet in length. Since infection from this worm can take place, so far as known, only from eating fresh-water fish that are infested with the larval form (plerocercoid), it is practically certain that American fishes have become the hosts of this parasite. In endeavoring to account for this condition the author suggests that the sewage from cities with a large foreign population may be sufficient to furnish the required infection of the intermediate host. Since at least ten European species of fish serve in this capacity, it is not unreasonable to conclude that there would be found in this country some forms in which the larvæ of the worm would thrive.

C. E. MCCLUNG,
Secretary.

TOWN AND GOWN.[1]

ON an old French sun-dial is a motto to this effect: All passes in time and time itself; but eternity does not, nor love. This last is the permanent thing, in which the universe and human society are founded. So these hundred and fifty years of our university, just past, being as they were but a moment in the morning of its life, compel us to look not backward, but at the present and the future. The Greek fool who ran so far to get a start that he could not jump when he reached the mark is perhaps a symbol of some university men who spend their lives in preparing to live; but not of the university itself, which renews its strength in action and endures forever, if true to itself. Founded in faith and devoted to liberal learning, Columbia has successively welcomed faculties of the learned professions and faculties of natural and applied science, fearless, persistent, aggressive. The boughs rival the trunk; action and reaction develop a wholesome struggle; the air hereabouts is keen and sometimes both tense and tumultuous. We have not merely renewed our youth, we have transformed ourselves and start afresh.

Among the questions of our new morning is this: Have we a new conscience and what about the moral sense of our community? For example, certain trademarks have a high commercial value. Such an one is the bachelor of arts. Its chief renown, however, is intellectual and social. The reason is that for ages it connoted a certain training. Those who held it have been the heirs of human experience; they have understood the continuity of thought, the organic nature of society and its institutions, the value of order and proportion, the charms of fancy and imagination, the interpretation of the past for use in the present and future. From them comes the birthright because among them were

[1] Address at the opening exercises of Columbia University, 1905.

> the kings of thought
> Who waged contention with their time's decay
> And of the past are all that cannot pass away.

Somewhat more than a generation since, the cry arose for a training in the science of nature equally thorough with that in the sciences of man. The call was heeded because it was just. The machinery of scientific education was set in motion, and for nearly forty years the munificence of the American world has lavished untold wealth to improve it. Never was a movement better adapted to the humor of the time and to the designed end. The brand to be put on its product was either a technical degree or the newly invented bachelor of science. The world of to-day is grateful to the men who hold those proud and honest degrees. To them the world is indebted for incalculable well-being, and Columbia is proud of those she numbers among her children. The liberal elements she inspired and infused into their scientific training gave life to inert things and related matter to mind.

The spread of this education has been so rapid and its work so fruitful that its quality has been misjudged; unfortunate comparisons have been instituted; and at last the specious effort is making, here and elsewhere, to erase the name of science from the label. The hue and cry has gone up that so much work on any material is as valuable as the same amount on any other. If this were true, what a dull monotony would life and nature be! What is really meant is, however, even worse; because it is not merely untrue, but misleading. It is the demagogue's claptrap and soft-sawder, that all work and all subjects and all men are equal and identical and are to be designated by the same badge. If this really indicates the state of our minds, it is time for self-examination. The evolution which has brought us to this is strange indeed and the situation is so new and anomalous that the relation of Columbia to her home, the duty of the University to the City, the service which Gown may render to Town, suddenly loom up, not as vague, intangible matters, but as concrete realities of the first importance.

Where and when was there an imperial city so heterogeneous in population, with the masses in absolute control through the free ballot, with equal rights of every sort guaranteed and enforced by the nation, with ignorant and unskilled mechanics in charge of the most delicate and complex social machine hitherto devised—an organism which has been the evolution of centuries, the frail heir of the past, the ancestor of ages yet to come? The reaction of the university and its environment under such conditions must be something powerful for untold weal or woe to millions. Let us not be blind fatalists; the battle is to the strong. Our example is just as subtle and our responsibility just as great, as is the moral force of this anomalous aggregation of mankind upon us. What we do in our own affairs may change the course of empire; and if we say that white is black, that the potter is the clay, that one sort of training is identical with another, and so on through the whole weary round of quibbles and evasions, we stultify ourselves and lead our blind followers into the ditch. Is it for this we have renewed our youth? Are these great throngs of students, is this great community, to learn such lessons, far more important than the learning of the schools? Does the outward splendor of this acropolis house faculties and professors who change with the winds of doctrine that blow from off the broad expanses of untilled social alluvium around what ought to be our mountain of sacrifice? Certainly not; our opportunity to till these fertile fields is almost too splendid, if we can seize it.

Here is the Orient, projected into the West; the earliest and the latest East, un-

changed and unchanging in its own lands, thrown into a society whose highest ambition is change. The Jew, the Levantine, the Mongolian; these are all here in a countless host with all their virtues and all their faults. *In seinen Göttern malt sich der Mensch.* Their religion is their all; their jurisprudence, their politics, their morals. If they lose their awe, their trust, their national cult, their lords of battle, their great prophets—what do we give them instead, bread or a stone? Here is not only the ancient world, but the middle age; a political feudalism, a social hierarchy, almost as perfect as those of the thirteenth century; a medieval church in unsurpassed majesty, festivals of an age-worn creed and system that vie with our national holidays and even surpass them in the interest of the celebrants. And thirdly, in regard to numbers at least, we have to search with a lantern for the Dutchman, the Huguenot, and the Briton, English, Scotch or Irish, who were once in control of this metropolis. But they can be found, few as they are; they are here and in power; responsible still for the moral standards which guide this civic life; responsible too for the immorality that seethes beneath the surface of commercial life, responsible, let us hope, for the lance and probe which open the periodic sores of both to the healing light of day and airs of heaven.

How are we to perform our *rôle,* to do our imperative duty, in the midst of this amazing congeries of unrelated parts? How are we to reap the rich harvest which may be garnered for ourselves and for humanity in this the most fertile social field ever enclosed? The mixed races of the world have been its conquerors. What Greece devised, Rome, that imperial compound of Latin, Celtic, German and Oriental ingredients, imposed by force on the then known world. Another mixed race, the Turks, overwhelmed Byzantium; and in the Western Empire, the blend of Angles, Saxons, Jutes, Danes and Celts, a mingled drift flung afar on the rocky confines of Gaul and Britain, established its sway, disseminating the heritage of Rome, Christian and Pagan, to the ends of the earth. So we, in turn, a still more wondrous conglomerate of all peoples, nations and languages that dwell upon the earth, may grasp a still larger inheritance, and in our turn transmit it to all mankind; the United States of the world.

In Lessing's great dialogue on free-masonry, he shows how every individual man has secrets and aspirations which he can not reveal, even if he would. Those on which he touches are largely political and belong fortunately to history. But, for a familiar example, here is the mystery of our very being. Do we really exist or are we phantasms? We can prove nothing absolutely, one way or another; but for all that we do exist, we do live and think; and we behave according to that conviction. Where is the proof of sense-perception? Yet we do perceive; and behave accordingly. What can we know? Nothing absolutely, perhaps, but something, even though relatively, something actually, because we conduct ourselves according to convictions based on reality, as the test of action proves. Man can not live without political organization, yet it is the bloody struggles of states that destroy men, physically and morally, as does no other cause. We have discarded the doctrine of races as unscientific; yet race-struggle is an uppermost question in the mind of every serious man. By analogy with these instances, university theories and ideals reduce themselves when carefully considered to matters of conduct, to an attitude of mind and a course of behavior. Theories and ideals, much vaunted as they are, seem very unreal and elusive; morals are concrete and vitally important.

The hour for discussion, profession and experiment has passed, our works must now speak for us.

Far and near throughout the country this university morality, this mental pose and whatsoever proceeds from it, have in a high degree displaced the older sanctions and been erected into a sort of cult. This will prove a disaster, unless we are most conservative. Our standards, though not very precise as yet, are very genuine and very real. As yet, too, they have engrossed attention from the inner circle only, and have not engaged the critical attention of the great world. But the transition is on us and is beginning; here we stand. We make our appeal for support in the new era, no longer to sympathetic friends alone, but to all givers—to the community, for money and for sympathy. The community asks: what do you want it for? Because of the service we render. And, pray, what is the service? We furnish the best citizens. Is that so sure? Many worshipers of the main chance are university men. We advance knowledge: Give the items. We mould opinion: That is an open question. And so on, and so on. On all these points we can offer proof and make a stand; but the proof is not convincing to every one. We are compelled to go further back and state our principles; to say, what we exist for is the maintenance of standards; the service we render is the creation of ideals by faith and sympathy, and, far above this, the practice of what we profess, the realization of those ideals in education, citizenship, politics and religion. Our banner is a tricolor and its stripes are three: firmness, tolerance and temperance.

No wonder that men worship at the shrine of natural science. Before and since Pilate, men have been asking: What is truth? As the world understands it, science professes to tell us first that the search is vain, there is no absolute truth; and secondly, that what relative truth there is, she alone has discovered and of it she is the sole guardian. This is a proud claim, and science, like many men, has been largely taken at her own estimate of herself; especially since by her means the face of nature has, within a century, been changed more than in all the centuries preceding taken together. Especially since further, the man of science, fearless, dauntless, adventurous, self-confident, steps forth with an imperious demand for leadership. Faith and ideals seem to be hollow terms in his ears: reality, investigation, knowledge, utility, these are the staple terms of his vocabulary. Yet his firmness is not that of which we speak and for which we plead, or at least not all of it, nor even much of it. In no period known to me, throughout the course of history, has the 'cocksureness of science' aroused such antagonism. Just in proportion as it has seemed to say: all truth is relative and material, the common soul has cried louder for pity, for sympathy, for balm in suffering and for the sustenance of love. Never have we known such a recrudescence of superstition, nor a longer catalogue of mysteries, each and all protests against the limitations of natural science and its scanty supply of food for the soul. A starved soul is, as the Romans thought, a malignant ghost, the most dangerous disturber of the public peace. When fed on negations, or on materialism, or on any husks which human experience has long since rejected, the natural, kindly, human mind becomes either a credulous dupe or a wolfish freebooter. Both sorts abound among us in dangerous proportions.

This, I suppose, is what my predecessor on this stage intended, when he wittily divided the field of knowledge into humanities and inhumanities. If I caught his idea, I can not altogether agree, for the contrast is not so alarming as that. One with-

out the other is like bread without salt, and both are necessary to a wholesome intellectual diet. The heart-searchings and modesty of the great souls in science are unknown to the world. The leaders need interpreters. The cocksureness of science is its danger; to be cocksure of different things at such short intervals does not inspire confidence in the conclusions, which have to be adjusted accordingly. It is the admixture of scientific research and the historical sciences—philosophy, philology and politics—that will produce the type of assurance which properly characterizes the university spirit. Here stands either a pharos or a wrecker's beacon; do we cast athwart the storm a broad beam of firmness in maintaining tried and tested expedients of life; or does a sputtering arc-light of novelty gather the moths and gnats to wonder and stare and perish?

'*Aurum accepisti,*' said Vincent of Lerino, '*aurum redde.*' Ages ago the standard yardstick was deposited in the Tower of London. It is, if you like, a clumsy, arbitrary standard; but it has kept order in the affairs of millions, generation after generation. Its value is in its permanence: fixed, true and immutable, though imperfect as other mundane things are, it has been an invaluable guide and has not been superseded, because nothing better has been found for homely daily use. So with the value of other standards and measures; their value is partly in their accuracy, but far more in their homely honesty, their maintenance of an intelligible and familiar standard. Some may desire for excellent reasons to substitute the meter for the yard, but no one has suggested that the yard be called a meter or the meter a yard. If the public desires one and rejects the other, very well; but it will have no juggling with the name.

Like other living organisms, Columbia needs new resources every day and hour. She was richly endowed for certain definite purposes by the founders; the deposit she received from them of learning, of morality and of religion, she must guard as talents entrusted to her by her master; and, like the faithful servant, she must win therewith other five. In the painstaking performance of this duty she has appeared to the thoughtless quidnuncs to be a very weather-cock of public fickleness, sensitive to public clamor in the never-ceasing adaptation of her course of study to public demands, a sort of department store of knowledge, with wares for every customer. It is estimated that even now by the doctrine of permutations and commutations and probabilities, we should be compelled to take fifteen thousand bachelors of art in order to find two who had done the same work for that degree.

Many wonder whether we do not respond too easily to the zephyrs of novelty blown every hour from off the Mars Hill of education in the American Athens. The idea is baseless. It is but fair to ourselves and our great community to announce from the housetop that, after three years of stock-taking and careful analysis of all the results of our experiments, we have reached a decision as to the meaning and nature of our degrees which shows us still fixed on the rock of our inheritance, accepting the old responsibilities as well as the new and performing the duties they entail. In this we want, as we believe we have, the enthusiastic support of all intelligent New Yorkers. Our society is not asking for revolutions or devolutions, but demands just such a trained leadership, bold and steady, loyal to tradition and history. The latest arrival among us is proud of the city's past and eager to catch its spirit.

And tolerance! What does this mean and how are we to exercise it? Does a tolerant spirit mean an indifferent one? Specialization and devotion mark the great

men of the age. Bismarck was a narrow person, a Pomeranian squire; Tennyson was a devoted man, a Victorian Briton; Lincoln was a Kentucky frontiersman, and Gladstone a devout Scotch boy with a passion, not for the British empire, but for Britain within the four seas. Moreover, one and all, they changed but little, keeping their character and standpoint to the end. It was by the leverage of their intense personality that they moved the world of the nineteenth century. But from the impregnable fortress of their convictions their outlook was sympathetic, and such prejudice as they began with gradually yielded to the catholic temper which made them world-heroes. Religious tolerance is an anachronism in the noontime of complete religious liberty. Is this equally true of race and social tolerance in a world of full civil and political liberty? Alas, no. Close association with Americans of the old stock, with those of the newer stock and with the latest throng of eastern immigrants—either personal experience or the best evidence proves the existence of a sorry bigotry and fanaticism. In this, Columbia has had and can have no share. An examination of our statistics shows how accurately our students and graduates are proportioned among the race and denominational elements of the great town and greater country. Let it be our purpose to banish prejudice and so to reap from the ripe harvest field at our door, for the benefit of the whole community, the fruits of the known world; from the Orient, ever old and ever new, its repose, its simplicity, its sense of unity, its imperious permanence; from medievalism its chivalry, its order, its trusting faith and its imperial sway; from modern Protestantism its free spirit and critical temper, its political and legal instinct, its powers of administration and disciplinary self-restraint. With such an ideal, we may be true to ourselves, keep academic peace with honor, command a catholic support and press onward to the goal of complete efficiency.

It might seem as if firmness and tolerance were incompatible virtues; to the stern logician they are, but in the moral order they are not. There is a sister grace which, though a third and separate one, enfolds and harmonizes the other two: the grace of moderation, temperance, patience. As the pure reason and the judgment, though equally potent and almost antipodal in their workings, are united in the mind by a faculty higher than both, viz., the practical reason, just so the moral force of temperance combines constancy and meekness into the very foundation of society. Not far from here is the home of reckless avarice, of self-indulgent greed. As long as the millions toil and save, the enormous aggregate of their economies will tempt the adventurous and the unscrupulous. Just so long must moderation be preached and practised by all who claim that mere mass and numbers count nothing beside contentment and the resources of a trained mind; the mind which, in Macaulay's definition of education, has acquired self-knowledge, accuracy and habits of strong intellectual exertion. Think of the door wide open before men so equipped! Of the grain nodding and drooping for the sickle! In one pivotal, fundamental point every human being of our island-city becomes an American, almost in the twinkling of an eye. Rationally or instinctively, every soul is aware that his civil and political rights in this commonweath are inherent in his own manhood, not a matter of inheritance or of privilege either bought or granted from above. They are not the gift of ancestry or the grant of organized society, but the term and mode of life itself.

Equality? no, except in opportunity;

fraternity? only in embryo, and in principle as yet; liberty? yes, with only the effort of emancipation from old-world thraldom and old-world, old-time prejudice. The conflict is hard, there are fierce lions on the path, the road is rough and steep. But courage! the devil of feudalism is dying, the student and the scholar mean to keep watch and ward, to fight if need be for the right. The struggle for social and economic liberty is quite as grand as that for political independence or liberty, and in it the meanest sweatshop worker or humblest day laborer acquires the dignity of his standard, narrow and selfish as his personal motive may be. Moreover, he knows his chance, slight as it appears; though the morning sun may never rise full on the plodding recruit, yet its struggling beams are rays of hope, and if he perish it will be in the dawn, with his face heavenward, and with the full assurance that his children may stand before kings. This and only this is the reason for our national and civic existence. There is truth in Hume's contention that all the king's state, his armies and fleets, his offices and treasuries, all the paraphernalia of government, existed only to get twelve good men into the box, and enforce their decision. Is our property to be safe? be just to the millions; are our lives to be secure? give the common man his chance; is education to thrive? share it with all. Open every door to every career.

In other words, let the university set up its standards and maintain them; let it conquer, not by the rude force of assertion nor by the leverage of society, commerce and athletics, but by the soft influences of precept and example, of tolerance, patience and endurance. Only with regard to temperance and moderation must there be an imperious voice. Among the doctrines of natural science which have become winged words is 'the struggle of life.' It is true as the law of unregenerate nature; so is the practise of gluttony, luxury and idleness. But no discipline has been so untrue to itself as science in this regard; witness its untiring efforts in medicine, penology and philanthropy generally, to preserve and save the unfit in their struggle for existence, when by its own profession it is exactly these classes who ought to perish from off the face of the earth. It is in this law of regenerate nature, in this supernatural and moral law of moderation and contentment, that the equal chance to all may be secured. A fair field and no favor is all that the toiling millions ask. This moderation is not, as many seem to think, a structural ornament of our social edifice. It is the cornerstone of the building; the university which hews and lays it truest is the architect of a temple, not merely fair without, but solid and foursquare like the walls of the new Jerusalem in the Apocalypse.

There is no finer definition of life than that it is the reciprocal interchange of relations. In this exchange the university attitude must be neither conventional nor artificial. To combine the fixed maintenance of undeviating standards with tolerance and self-sacrifice, we must be ever alert, adroit and versatile. The habit of the community must not enchain us, nor its fickleness divert us. The university man in the professions must be aggressively honest, intellectually as well as otherwise; in citizenship he must be watchful, unselfish and unsparing; and above all else in commercial life he must be temperate and self-denying. The extremes of shallow optimism and hopeless pessimism are the Scylla and Charybdis of university life, of university character; we must keep the middle course or we stultify ourselves. The excuse of legality must not be the defense of our dealings, nor the taint of expediency rest on our honors and degrees.

Columbia must open wide the flood gates of knowledge, but it must not sully the stream of education. It must be no mere department store for the delivery of intellectual commodities; there are bargain-counters for that elsewhere. Graduate or undergraduate, liberal or professional, male or female, every holder of a Columbia degree must be stamped with a hallmark of genuineness; must be sterling, or at least exactly as represented, if we are to serve the community which maintains and supports us.

Finally, though our task be a very hard task indeed, the hardest of all tasks, the task of setting a good example, let us still take courage. The history of our country is not one of degeneracy from noble origins. We are not like the potato, with the best of us underground. Just as our tasks have become more and more complicated and our responsibility heavier and heavier, our wits have grown keener and our shoulders broader. Never yet have we shirked when Apollyon offered us battle. Sound money, the civil service, the emancipation of the slave; these are some of the problems which the fathers bequeathed and we solved. Our Anglo-Saxon universities have made the new Japan, the new Egypt, the new Balkan kingdoms; at least their makers were men with the inspiration of either English or American universities—and other men of like training seemed destined to regenerate the whole Orient. At home the great offices in church, state and industry are held in the main by those who are trained to the flexibility of the university mind, men who, with the few exceptions which emphasize the rule, practise at the same time the firmness, toleration and moderation which have been our theme. What others have done and are now doing we may do in even higher measure; but only by keeping the fountain pure. If we are to deliver to New Yorkers the goods which New Yorkers need, we must not stand nor recede, but improve both the quantity and the quality; we must make them attractive and trustworthy; we must label them as they are; and as we succeed or fail, we show our viability or our unfitness.

Platitudes are a stumbling block to the shallow novelty hunter, and axioms are a weariness to the multitude; but to the earnest they are the renewal of wisdom every morning; they rekindle and illuminate the common sense of humanity which at times burns very low. Those which we have considered are among the most helpful. Three things are vain in our university life: faith without works, morality without religion, and precept without example. All our investigating and teaching and professing; all our sapience and assurance and mannerisms, will go for naught without a labor which is worship, a sympathy which is self-denial, and permanent standards which we adopt only for the better realization of the ideals which they express. Complexity without confusion is essential to high living; the wonderful organism of Columbia seems made for the task of harmonizing the discords in its urban home.

William Milligan Sloane.

The Organization of University Government.

The ideals and methods of university government have received considerable attention of late, stimulated by the recent discussions at the Conference of University Trustees at University of Illinois There have been several able presentations of different points of view respecting the relative functions of trustees, president and faculty in the control of the university. From these discussions it would appear that while the responsibility for financial and legal affairs, and, in certain emergencies,

for other matters of university administration must rest with the trustees, the general policy of development and administration should lie with the president and faculty. As to the relative shares which should belong to the president and the faculty there were developed decided differences of opinion, some, as ex-President Draper, standing for the policy of selecting a wise and strong president and entrusting him with the entire responsibility of the policy and administration, and others, as President Pritchett, favoring a policy of control by the faculty, relegating the president to a position of more limited authority. Certain facts may be considered as fairly established by the consensus of opinion of experts.

First. The trustees, usually men of affairs devoting but a limited portion of their time to university administration, are not often and can not often be experts in academic administration. While their education and experience may make them appreciative of the aims of university education, and may qualify them to administer wisely the financial and legal business of the university, their experience in university administration does not qualify them to conduct the internal administration nor the educational aims of the university.

Second. The faculty and the president, if he is, as he always should be, a university scholar of experience, are the real experts in educational policy and internal administration. They are selected because of their ability as scholars and educators and their whole attention and experience are given to the profession. They know, as no trustees can know, the needs and internal conditions of the university.

Third. It seems to be quite generally admitted that a strong, wise and experienced president with authority centered in his control is the most powerful agent for the effective growth and development of the university.

The problem, then, is how to preserve a proper balance of power between trustees, president and faculty so that all three factors shall most effectively cooperate for the material and intellectual development of the university, how to preserve the energy and initiative of the strong president, to utilize the administrative experience of trustees and the expert knowledge and experience of the faculty.

There is experience to justify the opinion that when trustees assume to manage the university and to control the policy of president and faculty, disorganization and weakness result. There is experience also to justify the opinion that a faculty uncontrolled by a strong guiding hand is not an effective governing body and that eventually control is assumed by the trustees or the president selected by them. This is particularly true with respect to such regulation of the personnel of the teaching force as is necessary to preserve a proper effectiveness and proportion in university development. Among other reasons for this are the fact that there is a divided responsibility, and a 'professorial courtesy' which stand in the way of needed reforms, and a dislike to take the initiative in personal discriminations which are sometimes necessary.

The most successful university administrations in this country are those in which a strong president has been legally vested with large powers of administrative control, or, because of his personal force, has been tacitly given and has used such control. Unquestionably government by a strong president who keeps in sympathy with his faculty and consults freely and frequently with its members and who also keeps in sympathy with and has the confidence of his trustees, is the most effective government and most economical of the

time and energy of the whole university.

But the organization of the university should make provision for less ideal conditions, so that taking trustees, president and faculty as they are likely to be, the system of government may tend to utilize to the fullest possible extent the wisdom and energy of all, and prevent the possibility that the influence of any one of these factors may be overridden or ignored.

The plan of government now established in Stanford University endeavors to conserve these ends in the following way.

The authority is vested in:

First. The trustees, who, in addition to the management of financial and legal affairs, make all appointments to the faculty and fix their compensation, but have delegated to the president all nominations for appointments or promotions and recommendations as to salaries.

Second. The president, in whom by the deed of trust is lodged the authority to prescribe the duties of instructors, to remove instructors at will, and such other powers as are necessary that he may be held justly responsible for the efficiency of teaching and the competency of teachers. In addition to these duties, by the acts of the trustees, the president is made primarily responsible for discipline in the university, is ex-officio chairman of the academic council and of its executive committee, and the official medium of communication between the faculty and the trustees, and between the students and the trustees. The president has also the initiative in all matters of appointments and fixing of salaries, subject to the approval of the trustees. By these provisions is sought to be maintained the effectiveness in administration due to the initiative of the president.

Third. The faculty—in which is vested through the *Academic Council*, consisting of all professors, associate professors and such assistant professors as have been in the service of the university for three years, the power to initiate and decide upon all matters of academic character—such as requirements for admission or graduation, advanced degrees, curricula, general university regulations, policies of all standing committees of the faculty and of departmental faculties—subject, of course, to such control by the trustees as is necessary for the proper exercise of their responsibilities.

The influence of the faculty upon such administrative matters as belong to the responsibilities of the president or the trustees is exerted through the *Advisory Board*, a body of nine professors elected by ballot without previous nomination, three each year, by the academic council. Of these nine members, one is elected by the whole council from each of five departmental groups into which the departments of the university are divided, and the remaining four are elected without reference to their positions in any such group. Each member must receive a majority of all votes cast for election. The members of this board are elected presumably on the basis of their qualifications as safe and wise counsellors of the president or the trustees. The duties of the board are to act as confidential adviser to the president upon matters which are not under control of the academic council, but belong to the executive responsibilities—to pass approval or disapproval upon all nominations for appointments, promotion, dismissals, the creation or abolition of chairs or departments. It is provided, however, that no recommendations for appointments, promotions or dismissals, or the fixing of salaries, shall originate with the advisory board. The initiative in these matters must come through the president. This provision had for its object protection against pressure brought to bear on the board by colleagues or others, and the pre-

vention of any development in the board of an influence in such matters which might unnecessarily disturb the relations of the members of the board to their colleagues or to the president or trustees.

On the other hand in matters of university policy in general the board is privileged to make such recommendations to the president as it may decide to be expedient. To further the full and free discussion of all matters which may come before the board, and to assure independence of judgment, it is provided that while the president of the university shall have free access to the board for purposes of information and consultation, he shall not be a member of it, and all conclusions of the board are discussed and formulated in executive session.

Decisions of the advisory board are communicated directly to the president and to no other university authority, and the president communicates them to the trustees in connection with his official recommendations. The trustees may at their discretion take cognizance of any differences of opinion between the president and advisory board thus brought to their attention.

It will readily be understood that such a board will exert a powerful conservative influence upon the executive from the faculty standpoint. It would be difficult for any serious differences to exist between president and faculty without the trustees having the issues thoroughly presented. As a conservative check the influence of such a board is doubtless more thoroughly effective than that of a committee of trustees, because the board is composed of members more nearly expert on university administration and local conditions than are the trustees usually. It has been objected that a board composed of members who hold their positions in the university at the will of the president will not exercise independent judgment, but this consideration will hardly have weight with those conversant with the character and temper of university faculties. On the contrary, there is much more danger that such a board with its constant sense of responsibility as representative of the faculty, will tend to be ultra-conservative in the matter of such changes in the faculty as may be needed in the interests of the effectiveness of university work.

While thus necessarily acting to a certain extent as a conservative restraint upon the president and indirectly at times upon the trustees, on the other hand the duty imposed upon the board to act as confidential adviser to the president, affords a natural and established channel for the president to keep in touch with representative faculty sentiment and to secure more carefully considered and responsible advice on certain classes of questions than is otherwise easily obtained.

The efficiency of the influence on the administration of such a board will in the long run depend upon the attitude of the trustees and of the faculty towards its functions. If the trustees systematically consider the decisions of the board in connection with the nominations or recommendations of the president, they will have additional assurance of the wisdom of the acts they are called upon to enact. If they systematically ignore the action of the board, its functions will soon become perfunctory or obsolete.

If the faculty systematically elect the members of the board with reference only to their judgment and discretion in the often difficult and delicate matters entrusted to their consideration, the influence of the faculty upon administration will be steadily strengthened. If, on the other hand, other less relevant considerations should enter into these elections, the influence of the board might easily be seriously

impaired and its conclusions discredited. The experiment at Stanford University is now in its second year, and, thus far, has met with very general approval, at least so far as the writer's knowledge goes. By this plan, the initiative of the president is sought to be preserved, but he is provided with a board of counselors, representative of the faculty, to advise him in the most important of his administrative acts. This influence can not amount to a veto unless sustained by the trustees, while it all the time cooperates with him by keeping him in constant touch with representative faculty opinion which has been carefully considered and formulated.

Certain purely administrative functions are placed under the control of the president rather than under the faculty. Such are the maintenance of discipline, the conduct of athletic, social and literary student activities, and public health. The president appoints committees from the faculty to assist him in these functions and the membership of these committees is also subject to the approval of the advisory board.

Other committees dealing with strictly academic questions are directly under the control of the academic council and answerable to the council.

The Executive Committee of the council is entrusted with much of the work which consumes so much time and energy at frequent and long-drawn-out faculty meetings at many universities. It consists of the president of the university, the vice-president and the registrar, as *ex-officio* members, and ten other members, two from each of the five department groups, elected by the council, much as the members of the advisory board are elected. The executive committee appoints the other standing committees of the faculty and controls their policy, subject to the approval of the academic council, and subject to instruction by the council.

The teaching force of each department of the university is organized as the *Department Faculty* under the chairmanship of an executive head appointed by the president, with the approval of the advisory board. The department faculty conducts the internal affairs of the department, subject to the control of the academic council in such matters as involve relations with other departments, and with the university at large.

The academic council thus controls through its various committees and departmental faculties the educational policy and machinery of the university, the president's influence herein being conserved by his position as presiding officer of the council and of its executive committee. Speaking generally the whole idea of the organization is to commit the business of the university in all its activities to the direction of those who are most qualified experts, to preserve the initiative and influence of the trustees, president and faculty within their respective spheres, to protect the rights and privileges of all arms of the university authority, and to insure, in so far as may be, the interests of the whole university as paramount to the interests of any one factor.

JOHN MAXSON STILLMAN.
STANFORD UNIVERSITY.

SCIENTIFIC BOOKS.

Flashlights in the Jungle: A Record of Hunting Adventures and of Studies in Wild Life in Equatorial East Africa. By C. G. SCHILLINGS. Translated by FREDERIC WHYTE, with an introduction by Sir H. H. JOHNSTON. Illustrated by 307 of the author's untouched photographs taken by day and night. Pp. xxii + 782. New York, Doubleday, Page & Co. 1906.

Herr Schillings's work on the wilderness of East Africa, called in its latest English edition 'Flashlights in the Jungle,' should interest a wide class of readers, but in particular

the naturalist and all who find the truth about animals often stranger and always infinitely better than fiction. One should not look here for biographies or detailed studies of any of the animals, nor for a critical analysis of their behavior, nor, indeed, for a hint of many of those problems which appeal most to a philosophic naturalist of the type of Darwin, or Wallace, and the author's zoological training is evidently not that of the schools. His frequent reference to 'my genus' and 'my species' takes us back to a period when the aims of natural history were too apt to reach a climax in the discovery of new forms. But we should not expect everything of a hunter of big and dangerous game, who is a good field naturalist in the bargain.

Taking it all together this author's accomplishment is remarkable, whether considered as a record of travel and adventure, as a portrait gallery or rather as a panorama of the great world of animal life under the equator, or as the journal of a field-naturalist whose sole object, as he tells us, was to study the lives of the animals.

It should be added that this narrative is not the only outcome of Herr Schillings's labors, for aside from the discovery of many plants and animals, ranging from giraffes and antelopes to insect-parasites, and including several species of birds, he was the first in recent times to take alive to Europe the East African rhinoceros, the white-bearded gnu, and other interesting denizens of the velt; he himself collected, and, at his private expense, with the help of a large caravan, prepared and forwarded to Berlin, and to the museums of other German cities, thousands of the skins, skulls and skeletons of the vanishing fauna of the great East African velt, besides collecting embryos and other anatomical or biological material.

This signal work has been achieved literally through the sweat of his brow, with the help of a physical constitution happily more than a match for the fevers which often laid him low, with the aid of a private fortune which seems to have been ample—in the famine year of 1899 his provisions alone (for he never had less than 130 men) cost him over five thousand dollars—with a keen enthusiasm for nature, and as he would add, with the aid of a lucky star which never left him for long at a time.

Schillings's book now authoritatively translated and published in this country makes a large and handsomely illustrated volume. It is admirably printed upon thin, highly polished paper, which serves well the purposes of engraving, even if it does not keep the size of the volume within bounds. The publishers seem to realize what many have not learned, that good half-tone engravings do not require the heavy weight of paper so often employed, and that the prints once made are easily marred by careless handling when fresh from the press. The illustrations are exceptionally free from 'pencil marks' produced in this way.

Preceding this edition by a few weeks there appeared an abridged translation of the same work, but under another title,[1] which the publishers of the complete and better edition denounce as 'pirated.' The illustrations of the lesser volume, which apparently were made direct from the engravings of the German work, rather than from the original photographs or blocks, are necessarily inferior, and do but scant justice to the beauty of much of Schillings's photographic work. One of these half-tone engravings, entitled 'Ibis Nests' (see p. 46), is even placed bottom-side up, but really it matters not how it is regarded on the page, for it is only a blur of printer's ink, and illustrates nothing.

There is an introduction by Sir H. H. Johnston, the discoverer of the okapi, and author of a recent elaborate work on the native races of man in East Africa, entitled 'The Urganda Protectorate.' The translation seems to be well done, and the text is extremely interesting from end to end. Appendices give full lists of the vertebrate animals discovered and collected, but the reader will look in vain for either an index or a map.

Both author and editor make an eloquent

[1] 'With Flashlight and Rifle,' Photographing by Flash-Light at Night the Wild Animal World of Equatorial Africa, translated and abridged by Henry Zick, Ph.D., pp. xiv + 422, with 123 illustrations; Harper and Brothers, New York, 1905.

and moving plea for the salvation of at least a remnant of the great Tertiary fauna of Africa—the lions and elephants, the hippopotami and rhinoceroses, the zebras, giraffes and big antelopes, which have all but vanished from South Africa, and which are now rapidly falling before the bullets of both whites and blacks all along the equatorial belt. The fate of these great beasts and many others besides is in the balance, and the history of the American buffalo is already being repeated in one section after another of the dark continent.

The world will, indeed, become very uninteresting if, as the author of the introduction remarks, man and a few domestic animals, with the mouse, the rat and the sparrow, are the only survivors among terrestrial vertebrates.

As an illustration of the reckless slaughter of the big animals by white travelers or temporary residents, the case of a certain German doctor is mentioned, who in the course of two or three years of fanatical zeal killed one hundred and fifty rhinoceroses (a companion having killed one hundred and forty more), and all for no useful purpose, "each one being a far more interesting mammal than himself. At the end of this career of slaughter, a rhinoceros killed him—perhaps appropriately." Notwithstanding such onslaughts, Herr Schillings thinks that the rhinoceros will survive, to impale such prodigies of human greed and folly, for generations to come, because of their fierce habits, their great numbers, and the inaccessible character of the mountain fastnesses over which they range. It would seem as if nothing short of disarming the native, and international legislation could save anything more than a remnant of those amazing hosts of interesting animal forms, which it has taken nature long geological ages to bring to perfection. The natives, equipped by the white traders, have already devastated South Africa. The white-tailed gnu, the true quagga, the mountain zebra, the Cape buffalo, the elephant, black and white rhinoceroses, the giraffe, the hippopotamus and the South African ostrich have been totally wiped out there with the exception of a few preserved individuals. The retreating squadrons have reached their limits under the equator. There they must be preserved now, if at all, for in a few years it will be too late.

While Herr Schillings disclaims any skill as an artist, his pictures reveal an artistic appreciation, and he is able to describe the scenes which he has witnessed with admirable vividness and enthusiasm. The great velt, the mysterious wonder-world of German East Africa, which, as he declares, must forever remain a forbidden and uninhabited land to the northern races of Europe, with its annual succession of flood and drought, and corresponding periods of rapid vegetable growth and decadent life, burning the traveler by day and almost freezing him at night, its pestilential marshes, its arid, salt-encrusted plains, its diversified surface and scenery, suggesting in places, during the wet season, great open parks in England and northern Europe, in others presenting perfect *chevaux-de-frise* of thorn bushes, impassable to every animal but a mouse or an elephant; flat in some places, in others undulating, with broken hills, lofty tablelands, volcanoes and almost interminable mountain ranges, the highest peak of which, Kilimanjaro, rises 19,500 feet above the sea, is crowned with eternal snow, and bears a whole upper world of glaciers under the tropical sun.

The most celebrated animals of the equatorial fauna, all of which Schillings has hunted, photographed and studied at close range, the great-tusked elephant, the fierce rhinoceros, the saber-like horns of which in old cows are sometimes nearly five feet long, the hippopotamus, the lion, the leopard, dreaded for its stealth and swift attacks, the fleet zebras and gnus, the strange giraffes, hyenas and antelopes of many kinds stalk through his pages in all the semblance of life, and, as a German zoologist has remarked, will live on in some of his admirable pictures 'long after they have been sacrificed to the needs of advancing civilization.' We see the largest of these, the elephants and rhinoceroses, in their endless migrations between the high mountains and the plains, following

the water courses, and the advancing growth of new vegetation with unerring precision, living among the clouds as readily as on the ever-changing plains of the great velt. Says Schillings:

> The velt is a book difficult to decipher, being written all over with the tracks and trails of the animal world. Right and left in our path, trees of vast strength are to be seen broken like bits of straw, showing where a herd of elephants have made their way. Large holes in the ground are come upon, which have been made by the elephants in the wet season, and which remain visible for a year or more. . . . The rhinoceros, too, leaves his mark. For many miles long tracks, which cross and recross, are found leading to the watering places. . . . And like the elephant the rhinoceros levies toll upon the shrubs and thornbushes.

Herr Schillings's first expedition to East Africa was made in 1896, when he determined to study the velt, and to obtain specimens of its representative animals, as well as photographs which should be transcripts from nature, and really illustrative of zoology. His last journey was undertaken in 1903. The second expedition failed in photographic results, owing to the unsuitable character of his apparatus. Accordingly, he returned to Europe, and after many trials succeeded in constructing at the celebrated Goerz establishment at Friedenau, a metallic camera and flashlight apparatus, strong enough to stand not only the strain of travel in tropical jungles, but more especially the effect of the powerful explosives employed.

Returning to Africa for the third time, he started for the interior with a caravan of one hundred and thirty people, but after an illness of three months from acute heart disease and malaria, he was obliged to throw up everything, and return again to Europe to recover, if possible, his health. On his fourth expedition to the dark continent he learned that 'a naturalist traveling on his own account encounters almost insuperable difficulties,' and his application to explore English territory was refused apparently because an Englishman had recently been debarred from German East Africa.

To appreciate the great advance in book illustration one has but to take from the shelf some works of travel and exploration, like those of Sir Samuel Baker of a half or even a quarter of a century ago. How ridiculous many of the pictures really are, and how they shame the text!

Since most of the large animals are nocturnal, Herr Schillings was obliged to resort to the flashlight, and some of his night pictures, obtained in spite of the greatest difficulties and hazards, are remarkable. The telephoto lens seems to have proved useful also, but he does not appear to have been equipped with a reflex camera, although this is a German invention, the improved forms of which are now fifteen years old, while the principle has been known for half a century. At least the lack of such an instrument would seem to account for so many of his moving objects, like birds, being out of focus. The lack of sharpness, on the other hand, lends to some of his landscapes a peculiar attraction. Thus some of his pictures of gnus and gazelles suggest the sentiment and poetry of a master like Corot. As evidence of this the reader should examine two charming pictures on pages 327 and 481—a herd of gnus and zebras taking flight from beneath the shade of a huge monkey-bread tree, and another herd of seven curious gnus all facing the camera and lighted from behind. In both of them what looks like a 'painted' sky is really the steep slope of a distant towering range of mountains.

Some of the rhinoceros pictures, showing these huge pachyderms feeding on the velt, bathing in the jungle, coming to the stream-courses and water pools at night, all most hazardous to obtain, are among the best in the book. The 'rhino' is dull of sight, but has keen ears, and a most phenomenal power of scent. When aroused it is up in an instant, swings quickly around, snorting loudly, to get the scent. Now is the opportunity for the photographer, but it lasts only a second, and the hand which releases the camera must be quick to seize the rifle. The animal is almost sure to charge, and when it does so, it comes with the speed of an express train; escape by running or dodging is no more effective than climbing imaginary trees or pulling oneself

up by the boots; a bullet well placed, and that quickly, can only check the fury of the beast, and there may be more than one adversary with which to reckon. Possessed of such a wonderful scent, together with certain other habits which are described, not to speak of memory, it is not surprising that they seem to possess such unerring knowledge of the velt.

Many interesting facts in natural history are recorded in the pictures and text. The South African ostrich breeds in September and October, and nests were found with eight to twenty-five eggs during those months, while a single egg was taken from the ovary of a female shot at the end of February. This sporadic activity of the reproductive organs outside of the breeding season, attributed to excessive feeding on newly sprouted grass, was often observed by the natives, who frequently found single eggs scattered over the velt. Many similar cases among our own wild birds could be given.

The common stork, *Ciconia ciconia*, which winters in vast numbers in equatorial East Africa, were preparing to migrate in early February, while some even remained until the first of April. On April 2, 1904, I saw great numbers of these storks, on the desert in Nubia above the first cataract of the Nile, huddled together like a dense flock of sheep. They were very wary and would not allow even a rider to approach them. Five days later the advance guard had reached Edfu, sixty miles northward, and were fraternizing with Arabs in the ploughed fields. Though bound for Europe, they appeared to be advancing at the leisurely pace of twelve to fifteen miles a day.

Schillings speaks of hawks seizing locusts on the wing, of 'sign-post' trees of elephants, or rubbing places, some of which he thinks must have been in use for hundreds of years: of the sleeping places of hippopotami on islands, 'which seem to have been in use for ages,' and their deep-worn paths leading down to the water; of the tail-language and dumbness of the giraffe, the harmony of the zebra's stripes with the coloring of the velt, the cunning of the ostrich in enticing the lion from its nest and young, the alarm-calls of the reedbucks heeded by birds, the watchfulness of the yellow baboons, and their wonderful alertness in flight, the tameability and affection of the marabou storks, the attachment which sprung up between a young rhinoceros and an East African goat, and the often fatal policy of first shooting at the lion when the lioness is near.

The connection between malaria and mosquitoes is well illustrated by the following account of the usual sequel to a night of shooting and photographing on the velt, although the very brief incubation here suggested does not accord with the common type of this disease:

> When the morning breaks I return to the camp, feeling as if broken to pieces, stung all over by mosquitoes, and with that peculiar sensation which unmistakably heralds an attack of fever. I was not deceived, and for two days I am confined to camp by a bad attack of malaria.

The water-famine in the dry season, the terrible pests of mosquitoes and flies of many kinds, which the traveler to the Nile valley in March and April should be able to appreciate, the scourge of malaria and dysentery following in their wake, not to speak of many other enemies which make the white man's burden well-nigh insupportable on the velt, will for long postpone the day when Herr Schillings's studies on the general natural history and photography of animals in equatorial East Africa are equaled or surpassed.

Francis H. Herrick.

SCIENTIFIC JOURNALS AND ARTICLES.

The Journal of Comparative Neurology for March contains the following articles: Margaret F. Washburn and I. Madison Bentley, 'The Establishment of an Association Involving Color-Discrimination in the Creek Chub, *Semotilus atromaculatus*.' An association involving the discrimination of red from green in the feeding reactions was quickly established under rigid experimental control. H. H. Newman, 'The Habits of Certain Tortoises.' Detailed observations upon five American fresh-water species. T. H. Boughton, 'The Increase in the Number and Size of the

Medullated Fibers in the Oculomotor Nerve of the White Rat and of the Cat at Different Ages.' The increase in number of medullated fibers is more closely correlated with the advance in body-weight than of age. The medullated fibers increase in size during the life of the animal. The two types, 'large' and 'small,' increase in diameter at the same rate. Dr. Edinger contributes a criticism of Dr. Yerkes' article on the sense of hearing of frogs, published last year, and this is followed by a reply from Dr. Yerkes.

The Journal of Nervous and Mental Diseases, for February, opens with a paper by Dr. Charles L. Dana on those forms of muscular atrophy which are progressive in character, and are degenerative and central in origin, viz., progressive ophthalmoplegia, bulbar paralysis, amyotrophic lateral sclerosis, and the various types of spinal progressive atrophy, whether beginning in the arms, legs, shoulders or hip girdle. The paper presents a clinical study of seventy-two cases, and is illustrated. Dr. Hoppe follows with a discussion of hysterical stigmata caused by organic brain lesions. Dr. C. K. Mills reports a case of crural monoplegia, probably representing the early stage of a unilateral ascending paralysis due to degeneration of the pyramidal tracts, and Dr. Spiller discusses briefly the question of separate sensory centers in the parietal lobe for the limbs.

THE *Journal of the Outdoor Life,* published at Trudeau, N. Y., in the Adirondack Mountains, has been made the official organ of the National Association for the Study and Prevention of Tuberculosis, of which Dr. Herman M. Biggs, medical director of the New York City Health Department, is president. The membership of the association includes the leading workers in the field of tuberculosis, both lay and professional, throughout the United States and Canada. The *Journal of the Outdoor Life* aims to be helpful to persons suffering from or having a tendency toward lung trouble. It deals with the outdoor treatment of tuberculosis in an intelligent and scientific manner and, while not advocating self-treatment by the laity, or attempting to supplant personal medical advice, it points out some of the common pitfalls that beset the unwary health-seeker. It advocates fresh air, nourishing food, carefully regulated exercise and competent medical supervision.

IN the near future the *Schweizerische Naturforschende Gesellschaft* intends to publish a national journal containing investigations by Swiss students of science. It will be supported by the Federal Government. At present the details concerning the character and form of the journal are being discussed by the various Cantonal branch societies.

IT is announced that *American Medicine,* edited by Dr. George M. Gould, will hereafter be published monthly instead of weekly.

DISCUSSION AND CORRESPONDENCE.

THE DISTRIBUTION OF GOVERNMENT PUBLICATIONS.

TO THE EDITOR OF SCIENCE: On page 7 of the issue of SCIENCE for January 5, 1906, in the address of the president of the American Association for the Advancement of Science, appears the assertion that the large editions of government publications imply a 'pecuniary waste,' because many of the copies fall into the hands of persons not competent to appreciate them. That seems a very short-sighted view, explainable only upon the theory that the distinguished speaker considered all who were not in position to receive, or buy, or secure access to limited editions are not competent to appreciate them. Large editions are greatly to be commended and are certainly not a pecuniary loss in the end, for with the constant increase of public and quasi-public libraries and consequent search for publications to complete the collections, and the increased demand arising from constantly increasing numbers of scientific workers, the great majority of copies of all worthy works sooner or later reach the hands of men who can use and appreciate them, or become available in school or public libraries. The high prices of many publications issued by educational institutions and private publishers pro-

hibit their possession by struggling and poorly paid workers in scientific fields both in and out of colleges and universities, who are fully able to use them and who could do more and better work if they had the volumes in their own libraries, instead of being compelled to waste so much valuable time in visiting public libraries. Are such investigators entitled to consideration, or should only a favored few be provided with proper facilities? Again, the limited editions of such publications only supply the immediate demand, leaving none for the investigators or colleges and public libraries of the future. The large editions of the government publications, on the other hand, make it possible for all workers and institutions to obtain them. The writer has found it practically impossible to obtain some university publications, while he has never had much difficulty in obtaining any of the government publications at very reasonable prices, from dealers in such works, the reason being the larger editions. The copies which pass into the hands of people who can not or do not wish to use them are not lost to the world, but soon find their way into the market places, where they may be had by the constantly increasing army of students.

The learned men of our eastern institutions, where books have been accumulating for a century or more and all of the early volumes of serial publications are available, can not appreciate the fact that any competent student can possibly be situated where he has not access to such literature. There are hundreds of competent men and women throughout the land, far from large libraries, doing excellent work in the advancement of science and capable of much better work with better facilities. Their very isolation from other workers makes the need of literature bearing upon their lines of work more necessary. The government gives them much information without cost and much more at merely nominal cost. Students of ability, making great sacrifices, living far from the centers of civilization in order to work up the flora, fauna or geological phenomena of sections unfrequented by scientists, are compelled, because of inability to consult the literature, to turn over the fruits of painstaking work to more prominent writers for publication, the real workers getting but scant credit therefor. It may surprise some eastern scientists to learn that many publications less than twenty years old, issued by educational institutions and learned societies, as well as important scientific magazines, are unavailable to Rocky Mountain students except by travelling hundreds of miles. The western libraries are comparatively young and lack endowments. The prices of many works preclude their acquisition, and limited editions of others make their acquirement impossible because they are already in possession of public and quasi-public libraries. This great need of the west is well worthy the consideration of wealthy men who wish to endow a noble cause. In the meantime the matter of limited editions should be discouraged as far as possible and large editions commended. The author of the sentiment herein criticized might learn a valuable lesson by noting the number of papers marked 'out of print' in the catalogues of university and society publications, including those of his own institution. Should 'out of print' be said of any publication, and should a work which the government can produce for from one to two dollars cost from eight to twenty-five dollars when issued by a great educational institution?

Another great misfortune is that so many publications are attempting to cover the same ground. This is particularly unfortunate in systematic zoology and botany, where one does not dare publish a new species without first searching the proceedings of all the local scientific societies, the publications of all the educational institutions and innumerable other works, unless he concludes to depend entirely upon general indices, which are usually quite incomplete. Every naturalist knows that descriptions of species are continually appearing in the most out-of-the-way and unexpected places. Zoologists and botanists should rise up in arms and protest against publishing such descriptions in any except serials devoted largely to such matters. One university has adopted an iron-clad rule that all original descriptions of species shall

be excluded from its publications, requiring them to be first sent to some prominent magazine devoted to the particular line. If others would do the same it would greatly simplify the work of naturalists.

JUNIUS HENDERSON.
MUSEUM, UNIVERSITY OF COLORADO,
BOULDER, COLO.

A SUGGESTION FOR AN INTERNATIONAL BIBLIOGRAPHIC EXCHANGE.

WE, in the United States, have long looked forward to the creation of a bibliographical institute in this country which will exercise supervision over all affairs coming within its scope. Two things are wanting: first, the requisite endowment, and, second, a wide and responsive spirit of cooperation. It is with the latter that this note will attempt briefly to deal. The writer recently suggested in the *Library Journal* (30: 857–858) that a bibliographic bulletin be issued by the Library of Congress to disseminate bibliographic intelligence, prevent duplication and incite cooperation. This would be an important step toward a solution of the problem, but there is yet another plan that seems also to give promise of immediate results.

Let the various historical and scientific societies adopt and distribute, in duplicate, a uniform blank calling for reports (titles and scope) of special bibliographies in preparation. Nearly every investigator is compiling a reference-list more or less extensive. The societies, upon receiving reports, should preserve the originals and transmit the duplicates, if of a scientific character, to the Smithsonian Institution of Washington, or, if not of scientific import, to the Library of Congress. The two last-named bodies could likewise distribute to their own clientele, single copies of a similar uniform blank. In fact, it might be well to have one of those two inaugurate the work, their formal blanks to be used as models by the societies, etc.

Example is better than precept. A plan analogous to that above described was successfully carried out by the librarian of the New England Historic Genealogical Society, 18 Somerset Street, Boston, Mass., who secured more than five hundred reports of genealogies in preparation. These are preserved in Tengwall files, in strict alphabetic order by surnames, and data therefrom are promptly supplied to inquirers. If one society of restricted scope can accomplish so much, what might reasonably be expected as responses to a like invitation extended by the Library of Congress or the Smithsonian Institution, having all literature and the whole learned world upon which to draw? This knowledge of inedited collections is often necessary and important. It is characteristic of our national impatience that we are not content with published material. Like the Athenians of old, we seek constantly that which is new. Nor is this altogether unreasonable: history and science are making such rapid progress that if a student expects adequately to review any subject, he must, perforce, avail himself of the very latest researches, bibliographical included. Hence, a growing list of special bibliographies in preparation would be very useful and would aid greatly in that general diffusion of knowledge for which one of our oldest institutions so nobly stands!

The suggestion made is one involving a minimum of expense; in fact, the cost would be merely nominal, with probable returns of manifold value. Means would thus be afforded for opening intercommunication between those interested in any subject. In this good work it must not be forgotten that the London *Notes and Queries* has quietly but unquestionably become the chief factor.

The Carnegie Institution of Washington, as well as many universities and colleges, could collaborate with the proposed exchange, to their mutual advantage. In this simple plan, therefore, seems to lie the possible development of universal cooperation or at least a nearer approximation thereto than has yet been manifested. A reviewer in the *Library Journal* (30: 428) commented on the extreme difficulty of arousing cooperation in bibliographic work, but is there not now within our power a way to gain even that desideratum?

EUGENE F. MCPIKE.
CHICAGO, ILL.,
December 12, 1905.

A SUMMARY OF THE BIBLIOGRAPHIE ASTRONOMIQUE OF LALANDE FOR THE YEARS A.D. 130 TO 1473, THE EPOCH AT WHICH SCIENTIFIC BOOKS BEGAN TO BE PRINTED.

THE following paragraphs give the skeleton of an investigation that was begun half a dozen years since and that is not likely to be carried further by the present writer. It is accurate so far as it goes, and those who are interested in astronomical anatomy may be glad to see the figures here set down, and will know how to clothe them with flesh. They constitute a very small but a genuine contribution to the early history of astronomy.

SUMMARY OF LALANDE'S TABLES.

During the	II. century	2 authors are mentioned.
During the	III. century	2 authors are mentioned.
During the	IV. century	3 authors are mentioned.
During the	V. century	5 authors are mentioned.
During the	VI. century	2 authors are mentioned.
During the	VII. century	2 authors are mentioned.
During the	VIII. century	2 authors are mentioned.
During the	IX. century	5 authors are mentioned.
During the	X. century	4 authors are mentioned.
During the	XI. century	8 authors are mentioned.
During the	XII. century	13 authors are mentioned.
During the	XIII. century	14 authors are mentioned.
During the	XIV. century	19 authors are mentioned.

Lalande's data are incomplete but, even so, they exhibit a fundamental fact. *The renaissance of astronomy in Europe began in the twelfth century, or even earlier.*

About the year 1440 the art of printing began to be practised in Europe, but it was not until 1471–3 that works on astronomy were put forth. The 'Bibliographie Astronomique' of Lalande, the catalogues of the great astronomical library of the Imperial Observatory of Pulkowa, and other works of the sort, contain lists of astronomical books arranged in the chronological order of publication.

We can follow the movement of European thought very closely by following such lists year by year. The titles of the books give precise information as to the matters uppermost in men's minds; the number of publications in each decade exhibits something like a numerical measure of their activity; the reprints of the works of classic authors show how much each generation leaned on the past; and the number of really original books indicates how far men were depending upon themselves. It is, moreover, very interesting to note how the places of publication slowly change from Germany to Italy. A true estimate of each century can, of course, be based only upon an examination of the books themselves. Rude statistics of the kind indicated are, however, of value.

I have, therefore, used the standard bibliographies of the years from the invention of printing (1440) to the date of the publication of the great work of Copernicus (1543) to prepare the little table that immediately follows.

TABLE SHOWING THE NUMBER OF ASTRONOMICAL BOOKS PUBLISHED IN EACH DECADE FROM 1472 TO 1600.

N. B.—*The numbers are the sum of the titles named in* Lalande's Bibliographie Astronomique *and in the* Catalogues of the Library of the Imperial Observatory of Pulkowa, *excluding duplicates.*

Undated books XV. century,	18 works.
1472–1480,	34 works.
1481–1490,	55 works.
1491–1500,	83 works.
XV. century (total),	190 works.
1501–1510,	73 works.
1511–1520,	88 works.
1521–1530,	81 works.
1531–1540,	152 works.
1541–1550,	130 works.
First Half XVI. century,	524 works.
1551–1560,	181 works.
1561–1570,	134 works.
1571–1580,	208 works.
1581–1590,	171 works.
1591–1600,	191 works.
Second Half XVI. century,	885 works.
XVI. century (total),	1,409 works.

The foregoing table exhibits the growth of astronomical publication very clearly. It shows a steady growth during the whole period from 1472 to 1600, and marks a decided increase of activity at the end of the first third of the sixteenth century, just before the advent of the epoch-making book of Copernicus.

EDWARD S. HOLDEN.

U. S. MILITARY ACADEMY,
WEST POINT, March 22, 1906.

SPECIAL ARTICLES.

A MENDELIAN CHARACTER IN CATTLE.

CURSORY observation led me some years ago to suspect that the polled character in cattle might be a Mendelian unit character. The importance of such fact, should it prove to be a fact, may be inferred when it is remembered that every year hundreds of thousands of cattle are dehorned, while certain breeders who are trying to breed polled specimens of the ordinary horned breeds are able to dispose of polled animals at prices double those of horned animals of similar breeding. During the past summer I had the opportunity to collect sufficient data on this subject to show that the character is in all probability actually Mendelian, and have worked out rules of procedure for breeders who wish to rid their cattle of horns. The data on which my conclusions are based are presented below. Before discussing them I wish to call attention to the real meaning of the term 'Mendelian expectation,' which I fear is overlooked by some biologists, who, like myself, are only slightly familiar with the mathematics of the laws of chance.

Let us consider the case of a cross between a hybrid (*DR*) with its corresponding recessive (*R*). Suppose the cross results in 4 progeny. Ordinarily we would say that the Mendelian expectation is 2 *DR* and 2 *R;* or, in greater detail,

	Parents.	Gametes.	Conjugations.	Results.
Male	*DR*	2 *D* and 2 *R*	2 *D* × *R*	2 *DR*
Female	*R*	4 *R*	2 *R* × *R*	2 *R*

Here it is an even chance whether a gamete of the female parent shall be fertilized by a *D* or an *R* gamete of the male parent. The four may, therefore, be fertilized in any one of the following five ways:

	Probability of Each Case.
1. By 4 *D* gametes and 0 *R* gametes,	1
2. By 3 *D* gametes and 1 *R* gametes,	4
3. By 2 *D* gametes and 2 *R* gametes,	6
4. By 1 *D* gametes and 3 *R* gametes,	4
5. By 0 *D* gametes and 4 *R* gametes,	1
	16ths.

The probability of each of these five possible cases depends on the number of ways in which each can occur. Cases 1 and 5 can occur in only one way each; 2 and 4 can occur in four ways each; *i. e.*, the first individual may be *R* and the remaining 3 *DR;* the second may be *R* and the others *DR,* etc. The third case can occur in six ways. And so on. Altogether there are sixteen ways; hence the probabilities shown in the last column. This means that, in sixteen such cases, on the average one case will result in 4 *DR* progeny, four will result in 3 *DR* and 1 *R* progeny, etc.; and this is the real Mendelian expectation. As the combination 2 *DR* and 2 *R* would occur oftenest (six in sixteen times) we usually designate it as the Mendelian expectation, but the case 4 *DR* is also to be expected, though it will not occur so often. It would be more accurate to refer to the combination 2 *DR* and 2 *R* as the highest (but not the only) expectation. Deviations from this highest expectation are to be expected, and the number and character of such deviations can be calculated from the laws of chance.

In studying the progeny of polled Hereford bulls bred to horned cows, the very interesting fact developed that the polled character is dominant, but the hybrids frequently have imperfectly developed horns, called scurs by breeders. No case has thus far been found in which a hybrid had fully developed horns. Whether scurs always appear on the hybrids has not been ascertained. Many of the hybrids examined had no visible scurs, but many of them were calves only a few months old. Breeders state that rather large scurs occasionally develop, especially on males, on animals a year or more of age.

It was not practical to examine all the hybrids observed closely enough to determine the presence or absence of very small scurs. Questions not fully determined, and which warrant further study, are: (1) Do the hybrids always develop scurs? Final examinations should not be made before the animals are about fifteen months old. A breeder reports one case in which large scurs developed at fourteen months. (2) Do the hybrids ever

develop perfect horns? No case of this kind was observed in my studies.

The table below gives the data secured during the past season. In the column headed 'breeding,' the symbol for the male parent stands first.

PROGENY OF POLLED HEREFORD BULLS.

P = polled; *H* = horned; *Ph* = hybrid.

Breeding.	Bull.	No. of Cows.	Progeny. *P* or *Ph*.	Progeny. *H*.	Highest Expectation. *P* or *Ph*.	Highest Expectation. *H*.
P × *H*	No. 1	5	5	0	5	0
P × *Ph*	" 1	6	6	0	6	0
Ph × *H*	" 2	56	28	28	28	28
	" 3	39	17	22	19 or 20	20 or 19
	" 4	12	7	5	6	6
	" 5	9	5	4	5 or 4	4 or 5
	" 6	7	2	5	3 or 4	4 or 3
	" 7	17	15	2	9 or 8	8 or 9
			74	66	70	70
	Omitting 6 and 7		57	59	58	58

Breeding.	Bull.	No. of Cows.	Progeny. *P* or *Ph*.	Progeny. *H*.	Highest Expectation. *P* or *Ph*.	Highest Expectation. *H*.
Ph × *Ph*	No. 5	6	5	1	5	1
	" 6	6	2	4	4	2
	" 7	3	3	0	3 or 2	0 or 1
	Totals		10	5	11	4

From the above table it will be seen that the highest expectation is realized or very nearly so in nearly every case. Of the three cases in which the departures are considerable, in two the numbers of progeny are small (bull No. 6); in addition there is probably an error in the records in this case (see below). In the other (bull No. 7, *Ph* × *H*), the records are incomplete, and may be in error, as explained below. Omitting these two bulls from the third group, the results are very near indeed to the highest expectation.

Bull No. 1.—This animal is long since dead. The data concerning his breeding and his progeny were obtained from the records of the owner. His ancestry was such that he might have been either a pure poll or a hybrid. On the theory that he was a pure poll, and that the polled character is dominant, his progeny from both five horned and six hybrid cows (cows having one horned parent) are all polled, as they should be.

Bull No. 2.—This is a so-called 'freak,' or polled bull from horned ancestors. His numerous progeny show him to be a hybrid. Some of his near relatives were polled, and it is probable that his dam was a hybrid with large scurs. This, at least, would account for his evident hybrid character.

Bull No. 3.—This was another 'freak,' but with some polled kin. He is clearly a hybrid. His first owner bred him to five horned cows, and all the progeny had horns (or large scurs (?)). His next owner bred him to 34 cows and secured 17 polled and 17 horned calves.

Bull No. 4.—This bull was from No. 2 (hybrid) and a horned cow. He has rather large scurs, rather loosely attached to the skull, and both his breeding and his progeny show him to be a hybrid.

Bull No. 5.—Out of a horned cow and by a polled bull, hence a hybrid. His progeny in both the third and fourth groups meet the highest Mendelian expectation.

Bull No. 6.—This is another 'freak,' a registered Hereford. He has small scurs. How he came by his apparent hybrid character is unknown. It will be noticed that when bred either to horned or hybrid cows his horned progeny are in excess of the highest expectation. This is probably an error. His owner, for fear of misrepresenting facts to purchasers, states that he has always counted large scurs as horns, and they so appear in his records. Although the number of progeny is small, and might, therefore, depart widely from expectation without vitiating the results, it is probable that a careful examination of his progeny, which I was unable to make except in a few cases, would show that the actual numbers agree more closely with expectation than those shown.

Bull No. 7.—In this case the departure is very large, in the case of progeny from horned cows. By his breeding he must have been a hybrid, unless his owner erred in recording the dam as horned when she was really a hybrid with large scurs. Both sire and dam are dead, and this point can not now be determined. It is possible, however, that this error was made, as the owner is the breeder

who, as above stated, recorded large scurs as horns. If the dam was really a hybrid, as I suspect, and the two horned calves in the third group had large scurs instead of horns, the results would agree exactly with the admissible theory that he was a pure poll. On the other hand, no record was made of a number of his get from common cows, so that, on the theory that he was a hybrid, the missing horned calves in group 3 may be the progeny of these unrecorded common cows.

From the above it will be seen that the only results not agreeing closely with theory are doubtful, while in every case where no doubt exists the results are in very satisfactory agreement with theory. These facts render it highly probable that the polled character is a dominant Mendelian unit character.

Dehorning a Breed of Cattle.—Assuming the above conclusion to be true, the dehorning of a breed of cattle is fairly simple. A single hybrid animal would suffice for this purpose, though this would require some inbreeding. It would be better perhaps for several breeders to cooperate, so as to avoid the necessity of inbreeding. An occasional polled animal occurs in all breeds of cattle, and these can be used in such a manner as to produce a new polled breed. In some instances polled animals of other breeds have furnished the starting point, it being possible to transfer the single character desired from one breed to another.

Suppose several breeders secure polled bulls (either pure polls or hybrids) to head their herds. These are bred to large numbers of horned cows. The get of the pure polls will all be polled hybrids, and half the get of the hybrids, in this case, will be polled hybrids. Now, by breeding these polled hybrids together we get one fourth pure polls, one half hybrid polls and one fourth horned. The pure polls thus obtained may become the basis of the future polled herds. The pure polls can be distinguished from the hybrids as follows: In the first place some (may be all) the hybrids will have scurs. In the second place, we may distinguish them by their progeny. Breed the animal to several horned animals; if the progeny are all polled, the polled parent is a pure poll; if half the progeny are horned, the polled parent is a hybrid.

In the case of males, if we breed to twelve horned cows and secure twelve polled calves, the chances that the male is pure and not a hybrid are 4,096 to 1. (Twelfth power of $2 = 4{,}096$.) If any of the twelve progeny develop perfect horns the chances are great that the bull is a hybrid.

It is more difficult to determine whether a polled cow is pure or hybrid. If she have scurs, even very small ones, she is hybrid. If not, so far as we now know, she may be either pure or hybrid. If she regularly produces polled calves from horned sires she is pure. But, when breeding for polled animals, it is expensive to test a polled cow in this way. The better plan is to be sure as to the males in all cases and treat all females as pure polls unless they have scurs or horns. In time the horns will disappear from the breed. It is highly important to remember that when a horned calf occurs in a polled breed, either it is a hybrid with horns, a thing not yet certainly known, or *both* of its parents are hybrids. There are undoubtedly a few such hybrids in all polled breeds, and when two such hybrids mate, one fourth of the progeny is horned. The number of such hybrids in a breed may be rapidly reduced by discarding both sire and dam of all horned animals that occur. The same thing will be accomplished less rapidly by discarding only the sires. The occurrence of scurs, but not perfect horns, in an established polled breed indicates that one parent only is hybrid.

W. J. SPILLMAN.
U. S. DEPARTMENT OF AGRICULTURE.

PRELIMINARY NOTES ON THE ARCHEOLOGY OF THE YAKIMA VALLEY, WASHINGTON.[1]

Archeological explorations[2] were made in the Yakima Valley, Washington, for the American Museum of Natural History in the

[1] Published by permission of the trustees of the American Museum of Natural History.

[2] The first report of these explorations appeared in *The American Museum Journal*, pp. 12–14, Vol. IV., No. 1, January, 1904. It was slightly revised and appeared in SCIENCE, N. S., pp. 579–

first part of the field season of 1903. These resulted in the discovery of a number of specimens and human skeletons, as well as the securing of several dozen photographs and a mass of field notes. Other data have been secured, both before the expedition and since, from collections and museums. The following preliminary account is made up from these results which may not be published in full for some time to come.

Central Washington is arid. In most respects the climate resembles that of the southern interior of British Columbia to the north. The summers are perhaps warmer and the winters colder. There is less vegetation and no trees are seen except in river bottoms or where irrigation has been successfully prosecuted. The prehistoric people had no great staples and had to rely upon perhaps even a greater variety of natural products than did the people farther north.

A glance at the linguistic map of Washington shows the great number of tribes inhabiting the general region. This suggests the possibility of the existence of more than one culture area within the same territory, although, of course, we may find several tribes, especially if they be subjected to the same environment, all within one culture area.

Definite age can not be assigned to the archeological finds, since here, as to the north, the remains are found at no great depth or in soil the surface of which is frequently shifted. Some of the graves are known to be of modern Indians, but many of them antedate the advent of the white race in this region or at least contain no objects of European manufacture such as glass beads or iron knives. On the other hand, there was found no positive evidence of the great antiquity of any of the skeletons, artifacts or structures found in the area.

The implements used in securing food include many chipped projectile points of bright-colored agates, chalcedonies and similar stone. Several small quarries of this material with adjacent workshops were found. While the bulk of the stone used was quite different from the black basalt employed to the north, yet a few points chipped from that material were also found. Points rubbed out of stone or bone were rare. Digging stick handles were seen, but no sap-scrapers were found.

Some small heaps of fresh-water clam shells were examined, but these being only about five feet in diameter and as many inches in depth are hardly to be compared to the immense shell heaps of the coast. Net-sinkers were made by notching and also by grooving pebbles. Such sinkers were very rare to the north and much more numerous here than on the coast, except near the mouth of the Columbia River, where grooved sinkers, usually slightly different from these, are found.

For preparing food pestles were used. These differ from those found either to the north or on the coast, many of them being much longer. Some had tops in the form of animal heads. Fish knives made of slate were not found and, it is believed, pottery was not made in the region.

Sites of ancient semi-underground houses, like those found in the Thompson River region, were photographed. Here, however, stones were seen on top of the embankment. No saucer-shaped depressions were seen, but circles of stones were found, which similarly may mark lodge sites, since the modern Indian has a lodge identical in shape with that found to the north, where saucer-shaped depressions occur. Pairs of arrow-shaft smoothers were seen.

An idea of the ancient form of dress was obtained from a costumed human figure carved in antler.[3] It had a feather head-dress like that of the present Indians of the region from here to as far east as the Dakotas. The hair

580, Vol. XIX., No. 484, April 8, 1904, and *Records of the Past*, pp. 119–127, Vol. IV., Part IV., April, 1905.

[3] Figured and described in the *Bulletin of the American Museum of Natural History*, Vol. XX., Article XVI., pp. 195–203, and abstracted in *The Scientific American Supplement*, pp. 23876–8, Vol. LVIII., No. 1490, July 23, 1904, and in *Records of the Past*, *l. c.* Data has since been secured which verifies most of the conclusions and completes other parts but disproves certain minor speculations.

was dressed and ornamented with dentalium shells. The body is represented as painted and with a fringed apron around the lions. The costume indicated is unlike that of the coast, but resembles those of the plateaus to the south and the plains to the east.

Besides a tubular form of pipe, one type consisting simply of a bowl was found. This is not seen among archeological remains from other parts of the northwest, although pipes used by the Thompson River Indians seem to resemble it. The fact suggests that the culture of this region is somewhat more closely related to that further east than are the cultures of the areas to the north and west.

Art work was found here as in the other areas. The object made of antler, engraved on one surface to represent a human figure in costume, which was found in the grave of a little child, is of good technique and artistic execution. The circle and dot design was common. Paintings[4] made with red and white on basaltic cliffs, many of which represent human heads with head-dresses and some the whole figure, were also seen. These were made up of lines and were pictographic in character. Sometimes such pictures were made by pecking into the surface of the columns, instead of by painting.[5] A design, similar to the part of these pictures interpreted as representing the head-dress, was also found pecked into the surface of a grooved net-sinker. Some of the pestles had knobs in the form of animal heads, but in general the art of the region tended to line work of geometric and pictographic patterns. The general style of art shows little resemblance to that of the coast but a strong relationship to that of the plains.

There were three methods of disposing of the dead. In this arid region are stretches of country locally known as 'scab-land,' on which are occasionally groups of low dome-shaped knolls from about fifty to one hundred feet in diameter by three to six feet in height. These knolls consist of fine volcanic ash, and apparently have been left by the wind. This ashy material has been swept from the intervening surface, leaving the 'scab-land' paved with fragments of basalt imbedded in a hard soil. The prehistoric Indians of this region have used many of these knolls, each as a site for a single grave. These graves, which are located in the tops of the knolls, are usually marked by large river pebbles, or in some cases by fragments of basalt that appear as a circular pavement projecting slightly above the surface of the soil. In one only did we find a box or cyst. This box was formed of thin slabs of basaltic rock, some placed on edge and two large flat slabs covering the cyst so formed. Above this, as was usually the case above the skeletons in this sort of grave, the space was filled with irregular rocks or pebbles. The skeletons were found flexed, on the side. In the graves artifacts, such as dentalium shells, were deposited at the time of burial. Simple graves in the level ground were not found. The rock slides, as in the region to the north, had frequently been used as burial places. In these the skeletons were always in a flexed position. Objects were found to have been placed in some of these graves. Rings of stones were also seen and on excavation within them cremated human remains were found usually several in each circle. In such places dentalium shells, flat shell beads and shell ornaments were usually seen.

The prehistoric culture of the region was apparently similar to that of the present natives.

Numerous evidences were found of the close communication of the people of this culture with tribes of the southern interior of British Columbia. The preponderance of chipped over ground points, digging stick handles, sites of semi-underground houses, pestles with tops in the form of animal heads, pairs of arrow-shaft smoothers, as well as tubular pipes, an incised decoration consisting of a circle with a dot in it and engraved dentalium shells each of a particular kind, besides rock-slide sepulchers and the custom of burying artifacts with the dead, were found to be common to both regions. Certain pestles and clubs made of stone differed from those found in British

[4] A few of which are figured and described in *loc. cit.*

[5] *Loc. cit.*

Columbia, while the chipped implements were made of a greater variety of stone, and more of beautifully colored material were found. Notched and grooved sinkers were much more common, and sap-scrapers were not found.

Considerable material of the same art as that found in the Dalles region was seen. It is clear that the people living in the Yakima Valley had extensive communication not only with the region northward, as far as the Thompson Valley, but also southward as far as the Dalles of the Columbia. In this connection it is interesting to note that the present Indians of the region travel even more extensively than would be necessary to distribute their artifacts this far.

Much less evidence of contact between the prehistoric people of the coast and that of the Yakima Valley was discovered. Many of the pestles and clubs made of stone were different from those found on the coast, where, it will also be remembered, artifacts were not found with the dead. A pipe,[8] however, and sea shells of several species were seen. The pipe is clearly of the art of the northwest coast. It was found far up the Toppenish River, one of the western tributaries of the Yakima.

In general the culture of the prehistoric people resembled that of the present natives and was affiliated with the cultures further east, but differed from both the prehistoric and present culture of the coast to the west and even of the southern interior of British Columbia to the north and The Dalles to the south.

From the whole series of archeological explorations, in British Columbia and Washington, begun in 1897 for the Jesup North Pacific Expedition and continued in 1903 for the American Museum of Natural History, we have learned that the material culture of the prehistoric people and the present natives was similar in each area examined; that the culture of the coast is of one sort, that of the interior of southern British Columbia of another; from which that of central Washington differs somewhat; and that there are several small culture areas lying adjacent to these. We find that each culture apparently developed independently or at least more in accord with its own environment and local tradition rather than with any outside influence, but that at various times, especially in the past, each has been influenced by one or more of the others.

In general the culture of the North Pacific coast does not extend far inland. Northward its limits are unknown, but southward it coalesces with that from the Columbia River in the region between Seattle and Shoalwater Bay. In the interior we have a plateau culture of which, likewise, that part to the north differs somewhat from that to the south.

Experience in this work emphasizes the advisability of conducting archeological investigations in cooperation with students of living tribes. A study of the modern Indian living in a country under investigation usually throws light on archeological finds made there, while an understanding of the antiquities of a region often helps in the study of the present natives. Besides, in this way the continuity of the historical problem is met by a continuity of method.

In selecting successive fields of operation it seems best always to continue explorations in an area so far distant from one already examined that new conditions will be encountered. This will make it probable that new facts will be discovered; possibly a new culture area. At the same time the new field of operations should be near enough that no culture may intervene. Thus the boundaries of culture areas may be determined and new areas discovered. This method of continuation from past fields of exploration allows any experience there gained to be of service in each new and adjacent field, while the discoveries in each new region may always lead to a better understanding of the areas explored and that perhaps in time for incorporation in the results to be published.

It remains to determine the northern, eastern and southern limits of the general plateau culture, how far it may be subdivided into

[8] Mentioned in *Museums Journal* and SCIENCE, *l. c.*, figured and mentioned in *Records of the Past*, *l. c.*

local culture areas, the interrelation of each of these, and of each to outside cultures.

But few specimens have been found in the whole area extending from the central Arctic region to the Columbia River, and from there southward along the coast to the Santa Barbara Islands, thence to the Pueblo region and eastward as far as the mounds of the Mississippi Valley. Literature on the archeology of the area is scanty. That whole region, north to the Arctic, across all the plains towards the east, and the plateaus south throughout Nevada, remains to be explored.

HARLAN I. SMITH.
AMERICAN MUSEUM OF NATURAL HISTORY.

CURRENT NOTES ON METEOROLOGY.

CYCLONIC DISTRIBUTION OF RAINFALL.

MENTION has several times been made in these columns of the great value of discussions of weather elements, not on the basis of monthly and annual averages, but on that of cyclonic control. A further contribution to such investigations is a report by J. A. Udden, 'On the Cyclonic Distribution of Rainfall' (*Augustana Library Publications,* No. 4, 1905). The method employed is the one familiarly known as the composite portrait method. The general region of a cyclone is divided into twenty-five areas, separated by four concentric circles and by a series of eight radii. The precipitation, wind direction and cloudiness shown on the 8 A.M. weather maps for a series of selected stations were entered in the appropriate divisions, and the results then summarized and charted. The stations are Davenport (Iowa), Amarillo, Dodge City, Wichita, Oklahoma, Helena, Miles City, Leander, Boise City, Detroit and Buffalo. In some cases the observations relate to the year 1899 only; in others the period covers several years.

CLIMATIC NOTES ON THE SAHARA.

Last summer Professor E. F. Gautier, of Algiers, crossed the Sahara between Algeria and the Niger River, being the first explorer to cross this wide part of the desert since Laing was murdered near Timbuktu in 1826.

Gautier says that the Sahara, viewed as a desert, is much less extensive than has generally been believed. The Adrar plateau, from 2,300 to 2,700 feet above sea-level, is not, properly speaking, a waste; and while he was still 360 miles from Gao on the Niger he reached a wide belt of steppe, which is the merging of the Sudan with the Sahara. This steppe region has its rainy season with about six to twelve inches of precipitation every year. This quantity suffices to cover the land with ponds and grass. Animal life is abundant.

Gautier distinguishes between the Tuaregs who ride on camels and those who use horses. The first inhabit the drier regions; the Tuaregs who use horses are on the whole more numerous and live in the steppe region and along the Niger.

The explorer found abundant evidences that this part of the Sahara once had a very large population of the Neolithic period of development. His finds included many arrow-points and axes of polished stone. Even the waste regions were inhabitable until a comparatively recent period. Proofs of this are found in the thousands of drawings upon the rocks, the graves in which, everywhere, the same kinds of implements and other objects were found, and the stones used for grinding grain. These stones show that agriculture was practised here, and that civilization was considerably advanced.

The gradual desiccation of this region advanced from the Sudan. To-day, however, the rain-belt is again extending more and more to the north. Gautier distinguishes these three epochs: the first was marked by dense population; the second by desert conditions, and in the third, or present period, the land is again assuming a steppe-like character. —*Bull. Am. Geogr. Soc.,* Jan., 1906.

METEOROLOGY OF THE SOUTH ATLANTIC OCEAN.

THE Meteorological Committee (London) has published a twelve-page pamphlet on the relation between pressure, temperature and air circulation over the South Atlantic Ocean, this being a summary of the facts set forth on a series of elaborate charts published previously by the hydrographic department of

the British Admiralty. The new pamphlet contains charts which show the variations, the position and the intensity of the anti-cyclonic areas, and their relation to the doldrums, the distribution of gales, fog, etc. Gales reach the South Atlantic by crossing the southern part of South America, or by rounding Cape Horn to the eastward. Fogs are rarely found north of the thirtieth parallel, except near the land on either side of the ocean, but it is increasingly frequent in higher latitudes.—*Nature,* January 11, 1906.

METEOROLOGICAL SERVICES IN SOUTH AMERICA.

THE latest information regarding meteorology in South America may be found in the *Monthly Weather Review* for September, 1905. Previous accounts of the South American meteorological services are those of A. Lawrence Rotch, 'The Meteorological Services of South America,' *American Meteorological Journal,* XI., 1894–95, 187–191, 201–211; and R. DeC. Ward, 'Meteorology in South America,' SCIENCE, N. S., V., 1897, 523–525.

PROTECTING CRANBERRIES FROM FROST.

A CRANBERRY grower at Cameron, Wis. (Mr. A. C. Bennett), protects his cranberries against frost in the following way. The marsh is surrounded by banks twenty-five to thirty-five feet high, with sloping sides. The principal reservoir is northwest of the plantation, and a trout stream is diverted around and outside of the marsh, forming a succession of reservoirs entirely surrounding the latter, from five to thirty rods wide. As the cold air descends from the high surrounding banks it must cross these reservoirs of water and pass over the dams before it can reach the vines.—*Mo. Wea. Rev.,* Oct., 1905.

NOTES.

PROMPTED 'by what has been urged against it by English physicists and others,' and 'by the inconclusive nature of the supposed results obtained by those who approve of it,' J. R. Sutton, of Kimberley, South Africa, has devoted some time to the black bulb thermometer *in vacuo.* His results have been published in *Trans. So. Afr. Philos. Soc.,* XVI., Part 2, Oct., 1905.

THE typhoon of June 30 and July 1, 1905, is discussed in the *Bulletin* of the Philippine Weather Bureau for July, lately received. Curves showing the barometer readings at Aparri and at Santo Domingo (the latter a barograph curve) are given. Students of tropical cyclones will find the frequent discussions of individual typhoons which are published in these *Bulletins* of great interest.

ANOTHER account of a tropical cyclone is a very much belated one of the West Indian hurricane of August 11, 1903, by Maxwell Hall, in the *Monthly Weather Review* for September, 1905. Several sets of barometer readings during the passage are given.

THE rapid progress which is being made in the exploration of the free air is evidenced by the fact that the British *Weekly Weather Report* for January 6 contains, for the first time, observations made during kite ascents during the first week in January.

R. DEC. WARD.

FREDERICK C. PAULMIER.

FREDERICK C. PAULMIER, Ph.D., zoologist to the New York State Museum, died in New York, March 4, in the thirty-third year of his age. Dr. Paulmier was a graduate of Princeton University of the class of 1894 and received the degree of M.S. in 1896. He held a university scholarship in zoology at Columbia in 1896–97, was appointed to a fellowship in 1898–99, was assistant in zoology in 1899–1900 and received the degree of doctor of philosophy in 1900. In the same year he became assistant in zoology at the New York State Museum at Albany, and in 1904 was appointed to the position that he held at the time of his death. During his connection with the museum he published a number of systematic zoological papers including catalogues of the reptiles and batrachians of the state (in conjunction with E. C. Eckel), of the higher crustacea of the region of New York City, and of the squirrels and other rodents of the Adirondacks (now in press). He also published papers on the crab fisheries of Long Island and on the life-history of the edible crab. His most considerable contribu-

tion to zoology was, however, an earlier paper (published as his doctor's dissertation) on the Spermatogenesis of *Anasa tristis*, which formed one of the first careful studies of the history of the 'accessory chromosome' since its discovery by Henking, and which gave important data for the general study of the reproduction problem in animals. He was a good observer, an enthusiastic field naturalist, and a master of the finer laboratory technique. He bore with cheerful courage a malady that for many years formed an obstacle to his scientific activity and at length caused his death. He had many interests outside the field of his special work and was a generous and helpful friend.

E. B. W.

MECHANICAL FLIGHT.

MESSRS. ORVILLE WRIGHT and Wilbur Wright, of Dayton, Ohio, under date of March 12, 1906, have addressed the following statement to the Aero Club of America:

Though America, through the labors of Professor Langley, Mr. Chanute, and others, had acquired not less than ten years ago the recognized leadership in that branch of aeronautics which pertains to bird-like flight, it has not heretofore been possible for American workers to present a summary of each year's experiments to a society of their own country devoted exclusively to the promotion of aeronautical studies and sports. It is with great pleasure, therefore, that we now find ourselves able to make a report to such a society.

"Previous to the year 1905 we had experimented at Kitty Hawk, North Carolina, with man-carrying gliding machines in the years 1900, 1901, 1902 and 1903; and with a man-carrying motor flyer, which, on the 17th day of December, 1903, sustained itself in the air for 59 seconds, during which time it advanced against a 20-mile wind a distance of 852 feet. Flights to the number of more than 100 had also been made at Dayton, Ohio, in 1904, with a second motor flyer. Of these flights, a complete circle made for the first time on the 20th of September, and two flights of 3 miles each made on the 9th of November and the 1st of December, respectively, were the more notable performances.

"The object of the 1905 experiments was to determine the cause and discover remedies for several obscure and somewhat rare difficulties which had been encountered in some of the 1904 flights, and which it was necessary to overcome before it would be safe to employ flyers for practical purposes. The experiments were made in a swampy meadow about 8 miles east of Dayton, Ohio, and continued from June until the early days of October, when the impossibility of longer maintaining privacy necessitated their discontinuance.

"Owing to frequent experimental changes in the machine and the resulting differences in its management, the earlier flights were short; but, towards the middle of September, means of correcting the obscure troubles were found, and the flyer was at last brought under satisfactory control. From this time forward almost every flight established a new record. In the following schedule the duration, distance and cause of stopping are given for some of the later flights.

"It will be seen that an average speed of a little more than 38 miles an hour was maintained in the last flight. All of the flights were made over a circular course of about three fourths of a mile to the lap, which reduced the speed somewhat. The machine increased its velocity on the straight parts of the course and slowed down on the curves. It is believed that in straight flight the normal speed is more than 40 miles an hour. In the earlier of the flights named above less than 6 pounds of gasoline was carried. In the later ones a tank was fitted large enough to hold fuel for an hour, but by oversight it was not completely filled before the flight of October 5.

"In the past three years a total of 160 flights have been made with our motor-driven flyers, and a total distance of almost exactly 160 miles covered, an average of a mile to each flight, but until the machine had received its final improvements the flights were mostly short, as is evidenced by the fact that the flight of October 5th was longer than the 105 flights of the year 1904 together.

Sept. 26	17,961 meters (11⅛ miles)	18 min. 9 sec.	Exhaustion of fuel.
Sept. 29	19,570 meters (12 miles)	19 min. 55 sec.	Exhaustion of fuel.
Sept. 30	.....	17 min. 15 sec.	Hot bearing.
Oct. 3	24,535 meters (15¼ miles)	25 min. 5 sec.	Hot bearing.
Oct. 4	33,456 meters (20¾ miles)	33 min. 17 sec.	Hot bearing.
Oct. 5	38,956 meters (24⅕ miles)	38 min. 3 sec.	Exhaustion of fuel.

"The lengths of the flights were measured by a Richard anemometer which was attached to the machine. The records were found to agree closely with the distance measured over the ground when the flights were made in calm air over a straight course; but when the flights were made in circles a close comparison was impossible because it was not practicable to accurately trace the course over the ground. In the flight of October 5th a total of 29.7 circuits of the field was made. The times were taken with stop-watches. In operating the machine it has been our custom for many years to alternate in making flights, and such care has been observed that neither of us has suffered any serious injury, though in the earlier flights our ignorance and the inadequacy of the means of control made the work exceedingly dangerous.

"The 1905 flyer had a total weight of about 925 pounds, including the operator, and was of such substantial construction as to be able to make landings at high speed without being strained or broken. From the beginning the prime object was to devise a machine of practical utility, rather than a useless and extravagant toy. For this reason extreme lightness of construction has always been resolutely rejected. On the other hand, every effort has been made to increase the scientific efficiency of the wings and screws in order that even heavily built machines may be carried with a moderate expenditure of power. The favorable results which have been obtained have been due to improvements in flying quality resulting from more scientific design and to improved methods of balancing and steering. The motor and machinery possess no extraordinary qualities. The best dividends on the labor invested have invariably come from seeking more knowledge rather than more power."

Very respectfully,
(Signed) Orville Wright.
(Signed) Wilbur Wright.

SCIENTIFIC NOTES AND NEWS.

Dr. Walther Nernst, professor of physical chemistry in the University of Berlin, will give this year the Silliman lectures at Yale University.

Sir George Darwin arrived in New York on March 23. He will represent the Royal Society, the British Association, the Royal Institution and the University of Cambridge at the anniversary meeting of the American Philosophical Society to commemorate the two hundredth anniversary of the birth of Benjamin Franklin, its founder.

Dr. Heinrich Bruns, professor of astronomy at Leipzig, and Dr. Hugo von Seeliger, professor of astronomy at Munich, have been elected corresponding members of the Berlin Academy of Sciences.

Professor Robert Koch, of Berlin, has been elected a foreign member of the Brussels Academy of Sciences.

Professor J. M. Pernter, director of the Vienna Meteorological Bureau, has been elected an honorary member of the London Meteorological Society.

Professor William A. Kellerman, of the Ohio State University, has returned from Guatemala where for three months he has been studying and collecting parasitic fungi. He reports a very interesting and satisfactory trip, and brings from several sections, especially from the higher altitudes including three volcanoes, a very large quantity of material for critical study. No mycologist has traversed these regions before, and it is expected that interesting results will be secured.

Dr. Paul Kuckuck, curator of the Biological Institute of Heligoland, has been granted the title of professor by the German government.

M. Bouquet has been appointed astronomer in the Paris Observatory.

Dr. F. W. Clarke, professor of mineral chemistry, George Washington University, will give a special course of lectures in chemical geology on Mondays at 4:50 P.M. as follows:

April 2.—'Introductory: The Elements and the Atmosphere.'
April 9.—'The Hydrosphere.'
April 16.—'The Magma and the Igneous Rocks.'
April 23.—'The Sedimentary Rocks.'
April 30.—'Ore Deposits.'
May 7.—'Coal, Petroleum and Natural Gas.'

Mr. William Sowerby, for many years secretary of the Royal Botanic Society, Regent's Park, died in Hertfordshire, on March 9.

The death is also announced of Dr. Hermann Lorberg, associate professor of physics in the University of Bonn; of Albert Nilsson,

lecturer in the School of Forestry at Stuttgart; and of Dr. v. d. Crone, assistant in plant physiology in the Agricultural School at Bonn-Poppelsdorf.

THERE will be a New York state civil service examination, on April 14, to fill the position of zoologist in the education department, vacant by the death of Dr. F. C. Paulmier. The candidate should be well versed in systematic and descriptive zoology and possess an acquaintance with the species of the New York fauna, especially those of mammals, birds, reptiles, fishes and mollusks. Museum experience in the care of such collections, in mounting, labeling and disinfecting, is essential, as the work is in a large degree curatorial. The salary is $1,200.

WE learn from the daily papers that, on March 27, Dr. Alexander Graham Bell's tetrahedral kite was put to use in some experiments, near Washington, with wireless telegraphy. It has been found troublesome to send messages across the Atlantic for want of towers in midocean. The idea of sending up kites of the tetrahedral pattern from midocean station steamers would solve the problem. Dr. Bell loaned one of his largest kites, having 230 cells, which was operated by W. F. Bedwin. The kite was sent up 2,000 feet, and from antennæ 400 feet long messages were caught and transmitted down over a steel wire. Messages were received from the United States naval wireless station at the Washington navy yard, from the De Forest station at Galilee, N. J., near Atlantic Highlands, and from the steamer Bermudian, 100 miles out from New York and more than 350 miles from the kites.

THE New York *Evening Post* states that Dr. T. Mitchell Prudden, professor of pathology at Columbia University and a graduate of Yale University, has given to the Peabody Museum of Yale University his collection of archeological objects connected with the ancient cliff-dwellers and Pueblos of southern Utah, southern Colorado, and the territories of Arizona and New Mexico, as well as some modern Pueblo material. The collection consists largely of pottery, textile fabrics, ornaments and objects used in ancient religious rites. With the collection Dr. Prudden gives the necessary cases, his field notes, and a map of the region drawn by himself.

THE sixth meeting of the Association of Teachers of Mathematics in the Middle States and Maryland will be held at Teachers College, Columbia University, on April 14.

We learn from *Nature* that the position of the South Africa medal fund for the endowment of a medal and scholarship or studentship in commemoration of the visit of the British Association to South Africa in 1905 is stated in a circular just issued by Professor J. Perry, honorary treasurer to the fund. The subscriptions promised or paid amounted to £752; and to this the council of the British Association has resolved to add the unexpended balance of the special South African fund, amounting to about £800. The following report of the executive committee was adopted at a meeting of subscribers on March 2, and approved by the council of the British Association:—(*a*) That the fund be devoted to the preparation of a die for a medal to be struck in bronze, 2½ inches in diameter, and that the balance be invested and the annual income held in trust; (*b*) that the medal and income of the fund be awarded by the South African Association for the Advancement of Science for achievement and promise in scientific research in South Africa; (*c*) that, so far as circumstances admit, the award be made annually.

THE German government has decided to establish a meteorological station on Lake Constance, near Friedrichshafen. It will cost $15,000, the states of Bavaria, Württemberg, Baden and Alsace-Lorraine joining in the expense. Extensive study of the atmosphere will be made daily by means of kites from specially constructed boats on the lake. Similar stations already exist in northern Germany at Lindenberg and Hamburg, and plans are being made to erect another station in the northeast.

MR. FEE writes, in a consular report, that the new standard time for India was adopted

in Bombay, on January 1, and is gradually overcoming the prejudice incident to a new departure. He further says: "The Indian standard time is in advance five hours and thirty minutes of Greenwich time, being nine minutes faster than Madras time, about twenty-four minutes slower than Calcutta time, and about thirty-nine minutes faster than Bombay local mean time, the longitude of the city of Bombay being 72° 52′ east of Greenwich. Five hours and thirty minutes advance of Greenwich time would be the local mean time for longitude 82° 30′ east of Greenwich. This parallel of longitude passes through India at about the eastern mouth of Godavery River in the Bay of Bengal, and near Benares, the sacred city of the Hindus, on the Ganges River. It is the local mean time of this parallel that now sets the standard of time for all India.

UNIVERSITY AND EDUCATIONAL NEWS.

Mr. Andrew Carnegie has given $2,000,000 in addition to previous gifts for the maintenance of the Carnegie Technical Schools, Pittsburg. It is also announced that Mr. Carnegie has expressed a desire that the Margaret Morrison Carnegie School for Women be completed as soon as possible, and has assured the committee that he will meet the expense.

By the will of the late Andrew J. Dotger, of South Orange, N. J., the Tuskegee Institute will receive $655,000 on the death of his wife.

It is announced that about $50,000 has already been raised for the new professorship of lumbering in the Yale Forest School of the $150,000 which is sought as an endowment. In fourteen western states $44,000 was raised from sixty contributors, representing in the main corporations and firms.

Official announcement has been made of the establishment of a Colonial School to be conducted by Yale and Columbia Universities. The school is intended to prepare students for work in foreign countries, in federal service, business enterprises or missionary or scientific work. The courses include six divisions —languages, geography, ethnography, history, economics and law. There will be a three-year course for candidates for the consular service and two years for other candidates. Students will receive a joint certificate, signed by the presidents of Yale and Columbia Universities.

The Morton Memorial Laboratory of Chemistry of the Stevens Institute of Technology, erected at a cost of $150,000 by the alumni in memory of Dr. Henry Morton, former president of the institute, is now occupied by classes.

The main building of the University of Idaho was destroyed by fire on March 30.

Professor A. W. Wright has announced his intention to retire from active service as professor of experimental physics and director of the Sloane Physical Laboratory of Yale College, at the close of the present academic year. Professor Wright graduated from Yale University in 1859, received the degree of doctor of philosophy in 1861 and has been professor there since 1872. He will be succeeded by Dr. Henry A. Bumstead, assistant professor in the Sheffield Scientific School. Professor Eugene L. Richards, who graduated from Yale in 1860 and has taught there since 1868, will retire from the chair of mathematics at the close of the present year.

Professor Howard Edwards, who holds the chair of modern languages in the Michigan Agricultural College, has accepted the presidency of the Rhode Island institution to succeed Kenyon L. Butterfield, who has been called to the presidency of the Massachusetts College.

Dr. Ralph B. Perry, assistant professor of philosophy at Harvard University, has declined the call to a chair of philosophy at Leland Stanford University.

Mr. Louis A. Martin, Jr., M.E. (Stevens), M.A. (Columbia), has been promoted from instructor to assistant professor of mathematics and mechanics in Stevens Institute of Technology.

Dr. W. A. Thornton has been appointed to the newly-created professorship of electrical engineering at Armstrong College, Newcastle.